

## Comparison of Current 10 CFR 835 and Final Amendment

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<p>Subpart A - General Provisions</p> <p>§ 835.1 Scope.</p> <p>(a) <u>General</u>. The rules in this part establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.</p> <p>(b) <u>Exclusion</u>. The requirements in this part do not apply to:</p> <p>(1) Activities that are regulated through a license by the Nuclear Regulatory Commission or a State under an Agreement with the Nuclear Regulatory Commission, including activities certified by the Nuclear Regulatory Commission under section 1701 of the Atomic Energy Act;</p> <p>(2) Activities conducted under the authority of the Director, Naval Nuclear Propulsion Program, as described in Public Law 98-525;</p> <p>(3) Activities conducted under the Nuclear Explosives and Weapons Safety Program relating to the prevention of accidental or unauthorized nuclear detonations;</p> <p>(4) Background radiation, radiation doses received as a patient for the purposes of medical diagnosis or therapy, or radiation doses received from voluntary participation in medical research programs</p>	<p>Subpart A - General Provisions</p> <p>§ 835.1 Scope.</p> <p>(a) <u>General</u>. The rules in this part establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.</p> <p>(b) <u>Exclusion</u>. Except as discussed in paragraph (c) of this section, the requirements in this part do not apply to:</p> <p>(1) Activities that are regulated through a license by the Nuclear Regulatory Commission or a State under an Agreement with the Nuclear Regulatory Commission, including activities certified by the Nuclear Regulatory Commission under section 1701 of the Atomic Energy Act;</p> <p>(2) Activities conducted under the authority of the Director, Naval Nuclear Propulsion Program, as described in Public Law 98-525;</p> <p>(3) Activities conducted under the Nuclear Explosives and Weapons Surety Program relating to the prevention of accidental or unauthorized nuclear detonations.</p> <p>(4) Radioactive material transportation as defined in this part;</p> <p>(5) DOE activities conducted outside the United States on territory under the jurisdiction of a foreign government to the extent governed by occupational radiation protection requirements agreed to between the United States and the cognizant government; or</p> <p>(6) Background radiation, radiation doses received as a patient for the purposes of medical diagnosis or therapy, or radiation doses received from participation as a subject in medical research programs.</p>
	<p>(c) Occupational doses received as a result of excluded activities and radioactive material transportation, as listed in paragraphs (b)(1) through (b)(5) of this section, shall be considered when determining compliance with the occupational dose limits at §§ 835.202 and 835.207, and with the limits for the embryo/fetus at § 835.206. Occupational doses resulting from authorized emergency exposures and planned special exposures shall not be considered when determining compliance with the dose limits at §§ 835.202 and 835.207.</p>
<p>§ 835.2 Definitions.</p> <p>(a) As used in this part:</p>	<p>§ 835.2 Definitions.</p> <p>(a) As used in this part:</p>
	<p><u>Accountable sealed radioactive source</u> means a sealed radioactive source having a half-life equal to or greater than 30 days and an isotopic activity equal to or greater than the corresponding value provided in appendix E of this part.</p>

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<u>Airborne radioactive material or airborne radioactivity</u> means radioactive material in any chemical or physical form that is dissolved, mixed, suspended, or otherwise entrained in air.	<u>Airborne radioactive material or airborne radioactivity</u> means radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.
<u>Airborne radioactivity area</u> means any area where the concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed 10 percent of the derived air concentration (DAC) values listed in appendix A or appendix C of this part.	<u>Airborne radioactivity area</u> means any area, accessible to individuals, where: (1) The concentration of airborne radioactivity, above natural background, exceeds or is likely to exceed the derived air concentration (DAC) values listed in appendix A or appendix C of this part; or (2) An individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hours in a week.
<u>ALARA</u> means "As Low As is Reasonably Achievable," which is the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. As used in this part, ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits of this part as is reasonably achievable.	<u>ALARA</u> means "As Low As is Reasonably Achievable," which is the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. As used in this part, ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits of this part as is reasonably achievable.
<u>Ambient air</u> means the general air in the area of interest (e.g., the general room atmosphere), as distinct from a specific stream or volume of air that may have different properties.	
<u>Annual limit on intake (ALI)</u> means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man (ICRP Publication 23) that would result in a committed effective dose equivalent of 5 rems (0.05 sievert) or a committed dose equivalent of 50 rems (0.5 sievert) to any individual organ or tissue. ALI values for intake by ingestion and inhalation of selected radionuclides are based on Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, <u>Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion</u> , published September 1988. This document is available from the National Technical Information Service, Springfield, VA.	<u>Annual limit on intake (ALI)</u> means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man (ICRP Publication 23) that would result in a committed effective dose equivalent of 5 rems (0.05 sievert) or a committed dose equivalent of 50 rems (0.5 sievert) to any individual organ or tissue. ALI values for intake by ingestion and inhalation of selected radionuclides are based on Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, <u>Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion</u> , published September 1988. This document is available from the National Technical Information Service, Springfield, VA.
<u>Background</u> means radiation from: (I) Naturally occurring radioactive materials which have not been technologically enhanced; (ii) Cosmic sources; (iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices); (iv) Radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and (v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.	<u>Background</u> means radiation from: (I) Naturally occurring radioactive materials which have not been technologically enhanced; (ii) Cosmic sources; (iii) Global fallout as it exists in the environment (such as from the testing of nuclear explosive devices); (iv) Radon and its progeny in concentrations or levels existing in buildings or the environment which have not been elevated as a result of current or prior activities; and (v) Consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation.
<u>Bioassay</u> means the determination of kinds, quantities, or concentrations, and, in some cases, locations of radioactive material in the human body, whether by direct measurement or by analysis, and evaluation of radioactive materials excreted or removed from the human body.	<u>Bioassay</u> means the determination of kinds, quantities, or concentrations, and, in some cases, locations of radioactive material in the human body, whether by direct measurement or by analysis and evaluation of radioactive materials excreted or removed from the human body.

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<p><u>Calibration</u> means to adjust and/or determine either:</p> <p>(I) The response or reading of an instrument relative to a standard (e.g., primary, secondary, or tertiary) or to a series of conventionally true values; or</p> <p>(ii) The strength of a radiation source relative to a standard (e.g., primary, secondary, or tertiary) or conventionally true value.</p>	<p><u>Calibration</u> means to adjust and/or determine either:</p> <p>(I) The response or reading of an instrument relative to a standard (e.g., primary, secondary, or tertiary) or to a series of conventionally true values; or</p> <p>(ii) The strength of a radiation source relative to a standard (e.g., primary, secondary, or tertiary) or conventionally true value.</p>
<p><u>Contamination area</u> means any area where contamination levels are greater than the values specified in appendix D of this part, but less than or equal to 100 times those levels.</p>	<p><u>Contamination area</u> means any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed the removable surface contamination values specified in appendix D of this part, but do not exceed 100 times those values.</p>
<p><u>Continuous air monitor (CAM)</u> means an instrument that continuously samples and measures the levels of airborne radioactive materials on a "real-time" basis and has alarm capabilities at preset levels.</p>	
<p><u>Contractor</u> means any entity under contract with the Department of Energy with the responsibility to perform activities at a DOE site or facility.</p>	<p><u>Contractor</u> means any entity under contract with the Department of Energy with the responsibility to perform activities at a DOE site or facility.</p>
<p><u>Controlled area</u> means any area to which access is managed in order to protect individuals from exposure to radiation and/or radioactive material. Individuals who enter only the controlled area without entering radiological areas are not expected to receive a total effective dose equivalent of more than 100 mrem (0.001 sievert) in a year.</p>	<p><u>Controlled area</u> means any area to which access is managed by or for DOE to protect individuals from exposure to radiation and/or radioactive material.</p>
<p><u>Declared pregnant worker</u> means a woman who has voluntarily declared to her employer, in writing, her pregnancy for the purpose of being subject to the occupational exposure limits to the embryo/fetus as provided in § 835.206. This declaration may be revoked, in writing, at any time by the declared pregnant worker.</p>	<p><u>Declared pregnant worker</u> means a woman who has voluntarily declared to her employer, in writing, her pregnancy for the purpose of being subject to the occupational dose limits to the embryo/fetus as provided in § 835.206. This declaration may be revoked, in writing, at any time by the declared pregnant worker.</p>
<p><u>Derived air concentration (DAC)</u> means, for the radionuclides listed in appendix A of this part, the airborne concentration that equals the ALI divided by the volume of air breathed by an average worker for a working year of 2000 hours (assuming a breathing volume of 2400 m<sup>3</sup>). For the radionuclides listed in appendix C of this part, the air immersion DACs were calculated for a continuous, non-shielded exposure via immersion in a semi-infinite atmospheric cloud. The value is based upon the derived airborne concentration found in Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, <u>Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion</u>, published September 1988. This document is available from the National Technical Information Service, Springfield, VA.</p>	<p><u>Derived air concentration (DAC)</u> means, for the radionuclides listed in appendix A of this part, the airborne concentration that equals the ALI divided by the volume of air breathed by an average worker for a working year of 2000 hours (assuming a breathing volume of 2400 m<sup>3</sup>). For the radionuclides listed in appendix C of this part, the air immersion DACs were calculated for a continuous, non-shielded exposure via immersion in a semi-infinite atmospheric cloud. The value is based upon the derived airborne concentration found in Table 1 of the U.S. Environmental Protection Agency's Federal Guidance Report No. 11, <u>Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion</u>, published September 1988. This document is available from the National Technical Information Service, Springfield, VA.</p>
	<p><u>Derived air concentration-hour (DAC-hour)</u> means the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the DAC for each radionuclide) and the time of exposure to that radionuclide, in hours.</p>

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<u>DOE activities</u> means an activity taken for or by the DOE that has the potential to result in the occupational exposure of an individual to radiation or radioactive material. The activity may be, but is not limited to, design, construction, operation, or decommissioning. To the extent appropriate, the activity may involve a single DOE facility or operation or a combination of facilities and operations, possibly including an entire site.	<u>DOE activity</u> means an activity taken for or by DOE in a DOE operation or facility that has the potential to result in the occupational exposure of an individual to radiation or radioactive material. The activity may be, but is not limited to, design, construction, operation, or decommissioning. To the extent appropriate, the activity may involve a single DOE facility or operation or a combination of facilities and operations, possibly including an entire site or multiple DOE sites.
<u>Entrance or access point</u> means any location through which an individual could gain access to areas controlled for the purposes of radiation protection. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.	<u>Entrance or access point</u> means any location through which an individual could gain access to areas controlled for the purpose of radiation protection. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.
<u>General employee</u> means an individual who is either a DOE or DOE contractor employee; an employee of a subcontractor to a DOE contractor; or a visitor who performs work for or in conjunction with DOE or utilizes DOE facilities.	<u>General employee</u> means an individual who is either a DOE or DOE contractor employee; an employee of a subcontractor to a DOE contractor; or an individual who performs work for or in conjunction with DOE or utilizes DOE facilities.
<u>High contamination area</u> means any area where contamination levels are greater than 100 times the values specified in appendix D of this part.	<u>High contamination area</u> means any area, accessible to individuals, where removable surface contamination levels exceed or are likely to exceed 100 times the removable surface contamination values specified in appendix D of this part.
<u>High radiation area</u> means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.	<u>High radiation area</u> means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.
<u>Individual</u> means any human being.	<u>Individual</u> means any human being.
<u>Member of the public</u> means an individual who is not occupationally exposed to radiation or radioactive material. An individual is not a "member of the public" during any period in which the individual receives occupational exposure.	<u>Member of the public</u> means an individual who is not a general employee. An individual is not a "member of the public" during any period in which the individual receives an occupational dose.
<u>Minor</u> means an individual less than 18 years of age.	<u>Minor</u> means an individual less than 18 years of age.
<u>Monitoring</u> means actions intended to detect and quantify radiological conditions.	<u>Monitoring</u> means the measurement of radiation levels, airborne radioactivity concentrations, radioactive contamination levels, quantities of radioactive material, or individual doses and the use of the results of these measurements to evaluate radiological hazards or potential and actual doses resulting from exposures to ionizing radiation.
<u>Nonstochastic effects</u> means effects due to radiation exposure for which the severity varies with the dose and for which a threshold normally exists (e.g., radiation-induced opacities within the lens of the eye).	<u>Nonstochastic effects</u> means effects due to radiation exposure for which the severity varies with the dose and for which a threshold normally exists (e.g., radiation-induced opacities within the lens of the eye).
<u>Occupational exposure</u> means an individual's exposure to ionizing radiation (external and internal) as a result of that individual's work assignment. Occupational exposure does not include planned special exposures, exposure received as a medical patient, background radiation, or voluntary participation in medical research programs.	<u>Occupational dose</u> means an individual's ionizing radiation dose (external and internal) as a result of that individual's work assignment. Occupational dose does not include doses received as a medical patient or doses resulting from background radiation or participation as a subject in medical research programs.

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<u>Person</u> means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency, any State or political subdivision of, or any political entity within a State, any foreign government or nation or other entity, and any legal successor, representative, agent or agency of the foregoing; provided that person does not include the Department or the United States Nuclear Regulatory Commission.	<u>Person</u> means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency, any State or political subdivision of, or any political entity within a State, any foreign government or nation or other entity, and any legal successor, representative, agent or agency of the foregoing; provided that person does not include the Department or the United States Nuclear Regulatory Commission.
<u>Radiation</u> means ionizing radiation: alpha particles, beta particles, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation as used in this part, does not include non-ionizing radiation, such as radio- or micro-waves, or visible, infrared, or ultraviolet light.	<u>Radiation</u> means ionizing radiation: alpha particles, beta particles, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in this part, does not include non-ionizing radiation, such as radio- or micro-waves, or visible, infrared, or ultraviolet light.
<u>Radiation area</u> means any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.	<u>Radiation area</u> means any area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.
	<u>Radioactive material area</u> means any area within a controlled area, accessible to individuals, in which items or containers of radioactive material exist and the total activity of radioactive material exceeds the applicable values provided in appendix E of this part.
	<u>Radioactive material transportation</u> means the movement of radioactive material by aircraft, rail, vessel, or highway vehicle when such movement is subject to Department of Transportation regulations or DOE Orders that govern such movements. Radioactive material transportation does not include preparation of material or packagings for transportation, monitoring required by this part, storage of material awaiting transportation, or application of markings and labels required for transportation.
<u>Radiological area</u> means any area within a controlled area which must be posted as a "radiation area," "high radiation area," "very high radiation area," "contamination area," "high contamination area," or "airborne radioactivity area" in accordance with § 835.603.	<u>Radiological area</u> means any area within a controlled area defined in this section as a "radiation area," "high radiation area," "very high radiation area," "contamination area," "high contamination area," or "airborne radioactivity area."
<u>Radiological worker</u> means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials, or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent.	<u>Radiological worker</u> means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials, or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent.
	<u>Real-time air monitoring</u> means measurement of the concentrations or quantities of airborne radioactive materials on a continuous basis.
<u>Representative</u> , as applied to the sampling of radioactive material, means sampling in such a manner that the sample closely approximates both the amount of activity and the physical and chemical properties of the material (e.g., particle size and solubility in the case of air sampling of the aerosol to which workers may be exposed).	

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	<u>Respiratory protective device</u> means an apparatus, such as a respirator, worn by an individual for the purpose of reducing the individual's intake of airborne radioactive materials.
	<u>Sealed radioactive source</u> means a radioactive source manufactured, obtained, or retained for the purpose of utilizing the emitted radiation. The sealed radioactive source consists of a known or estimated quantity of radioactive material contained within a sealed capsule, sealed between layer(s) of non-radioactive material, or firmly fixed to a non-radioactive surface by electroplating or other means intended to prevent leakage or escape of the radioactive material. Sealed radioactive sources do not include reactor fuel elements, nuclear explosive devices, and radioisotope thermoelectric generators.
	<u>Source leak test</u> means a test to determine if a sealed radioactive source is leaking radioactive material.
<u>Stochastic effects</u> means malignant and hereditary diseases for which the probability of an effect occurring, rather than its severity, is regarded as a function of dose without a threshold for radiation protection purposes.	<u>Stochastic effects</u> means malignant and hereditary diseases for which the probability of an effect occurring, rather than its severity, is regarded as a function of dose without a threshold, for radiation protection purposes.
<u>Survey</u> means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material and measurements or calculations of levels of radiation, or concentrations or quantities of radioactive material present.	
<u>Very high radiation area</u> means any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates.	<u>Very high radiation area</u> means any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from a radiation source or from any surface that the radiation penetrates.
	<u>Week</u> means a period of seven consecutive days.
<u>Year</u> means the period of time beginning on or near January 1 used to determine compliance with the provisions of this part. The starting date of the year used to determine compliance may be changed provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.	<u>Year</u> means the period of time beginning on or near January 1 and ending on or near December 31 of that same year used to determine compliance with the provisions of this part. The starting and ending date of the year used to determine compliance may be changed provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.
(b) As used in this part to describe various aspects of radiation dose:	(b) As used in this part to describe various aspects of radiation dose:
<u>Absorbed dose (D)</u> means the energy absorbed by matter from ionizing radiation per unit mass of irradiated material at the place of interest in that material. The absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 gray).	<u>Absorbed dose (D)</u> means the energy absorbed by matter from ionizing radiation per unit mass of irradiated material at the place of interest in that material. The absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 gray).

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<u>Collective dose</u> means the sum of the total effective dose equivalent values for all individuals in a specified population. Collective dose is expressed in units of person-rem (or person-sievert).	
<u>Committed dose equivalent</u> ( $H_{T,50}$ ) means the dose equivalent calculated to be received by a tissue or organ over a 50-year period after the intake of a radionuclide into the body. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem (or sievert).	<u>Committed dose equivalent</u> ( $H_{T,50}$ ) means the dose equivalent calculated to be received by a tissue or organ over a 50-year period after the intake of a radionuclide into the body. It does not include contributions from radiation sources external to the body. Committed dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).
<u>Committed effective dose equivalent</u> ( $H_{E,50}$ ) means the sum of the committed dose equivalents to various tissues in the body ( $H_{T,50}$ ), each multiplied by the appropriate weighting factor ( $w_T$ )--that is, $H_{E,50} = \sum w_T H_{T,50}$ . Committed effective dose equivalent is expressed in units of rem (or sievert).	<u>Committed effective dose equivalent</u> ( $H_{E,50}$ ) means the sum of the committed dose equivalents to various tissues in the body ( $H_{T,50}$ ), each multiplied by the appropriate weighting factor ( $w_T$ )--that is, $H_{E,50} = \sum w_T H_{T,50}$ . Committed effective dose equivalent is expressed in units of rem (or sievert).
<u>Cumulative total effective dose equivalent</u> means the sum of the total effective dose equivalents recorded for an individual for each year of employment at a DOE or DOE contractor site or facility, effective January 1, 1989.	<u>Cumulative total effective dose equivalent</u> means the sum of all total effective dose equivalent values recorded for an individual, where available, for each year occupational dose was received, beginning January 1, 1989.
<u>Deep dose equivalent</u> means the dose equivalent derived from external radiation at a depth of 1 cm in tissue.	<u>Deep dose equivalent</u> means the dose equivalent derived from external radiation at a depth of 1 cm in tissue.
	<u>Dose</u> is a general term for absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent as defined in this part.
<u>Dose equivalent (H)</u> means the product of absorbed dose (D) in rad (or gray) in tissue, a quality factor (Q), and other modifying factors (N). Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).	<u>Dose equivalent (H)</u> means the product of absorbed dose (D) in rad (or gray) in tissue, a quality factor (Q), and other modifying factors (N). Dose equivalent is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).
<u>Effective dose equivalent</u> ( $H_E$ ) means the summation of the products of the dose equivalent received by specified tissues of the body ( $H_T$ ) and the appropriate weighting factor ( $w_T$ )--that is, $H_E = \sum w_T H_T$ . It includes the dose from radiation sources internal and/or external to the body. The effective dose equivalent is expressed in units of rem (or sievert).	<u>Effective dose equivalent</u> ( $H_E$ ) means the summation of the products of the dose equivalent received by specified tissues of the body ( $H_T$ ) and the appropriate weighting factor ( $w_T$ )--that is, $H_E = \sum w_T H_T$ . It includes the dose from radiation sources internal and/or external to the body. For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures. The effective dose equivalent is expressed in units of rem (or sievert).
<u>External dose or exposure</u> means that portion of the dose equivalent received from radiation sources (e.g., external sources) outside the body.	<u>External dose or exposure</u> means that portion of the dose equivalent received from radiation sources outside the body (i.e., "external sources").
<u>Extremity</u> means hands and arms below the elbow or feet and legs below the knee.	<u>Extremity</u> means hands and arms below the elbow or feet and legs below the knee.
<u>Internal dose or exposure</u> means that portion of the dose equivalent received from radioactive material taken into the body (e.g., "internal sources").	<u>Internal dose or exposure</u> means that portion of the dose equivalent received from radioactive material taken into the body (i.e., "internal sources").
<u>Lens of the eye dose equivalent</u> means the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm.	<u>Lens of the eye dose equivalent</u> means the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm.



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<p><u>Quality factor</u> means the principal modifying factor used to calculate the dose equivalent from the absorbed dose; the absorbed dose (expressed in rad or gray) is multiplied by the appropriate quality factor (Q).</p> <p>(i) The quality factors to be used for determining dose equivalent in rem are shown below: [Table unchanged and omitted for brevity]</p>	<p><u>Quality factor (Q)</u> means the modifying factor used to calculate the dose equivalent from the absorbed dose; the absorbed dose (expressed in rad or gray) is multiplied by the appropriate quality factor.</p> <p>(i) The quality factors to be used for determining dose equivalent in rem are as follow: [Table unchanged and omitted for brevity]</p>
<p>When spectral data are insufficient to identify the energy of the neutrons, a quality factor of 10 shall be used.</p> <p>(ii) When spectral data are sufficient to identify the energy of the neutrons, the following mean quality factor values may be used:</p> <p style="text-align: center;">QUALITY FACTORS FOR NEUTRONS</p> <p>[Mean quality factors, Q (maximum value in a 30-cm dosimetry phantom), and values of neutron flux density that deliver in 40 hours, a maximum dose equivalent of 100 mrem (0.001 sievert).]</p> <p style="text-align: center;">[Table unchanged and omitted for brevity]</p>	<p>When spectral data are insufficient to identify the energy of the neutrons, a quality factor of 10 shall be used.</p> <p>(ii) When spectral data are sufficient to identify the energy of the neutrons, the following mean quality factor values may be used:</p> <p style="text-align: center;">QUALITY FACTORS FOR NEUTRONS</p> <p>[Mean quality factors, Q (maximum value in a 30-cm dosimetry phantom), and values of neutron flux density that deliver in 40 hours, a maximum dose equivalent of 0.1 rem (0.001 sievert). Where neutron energy falls between listed values, the more restrictive mean quality factor shall be used.]</p> <p style="text-align: center;">[Table unchanged and omitted for brevity]</p>
<p><u>Shallow dose equivalent</u> means the dose equivalent deriving from external radiation at a depth of 0.007 cm in tissue.</p>	<p><u>Shallow dose equivalent</u> means the dose equivalent deriving from external radiation at a depth of 0.007 cm in tissue.</p>
<p><u>Total effective dose equivalent (TEDE)</u> means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures.</p>	<p><u>Total effective dose equivalent (TEDE)</u> means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).</p>
<p><u>Weighting factor</u> (<math>w_T</math>) means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue (T). The dose equivalent to tissue, T, is multiplied by the appropriate weighting factor to obtain the effective dose equivalent contribution from that tissue. The weighting factors are as follows:</p> <p style="text-align: center;">WEIGHTING FACTORS FOR VARIOUS TISSUES [Table unchanged and omitted for brevity]</p> <p><sup>1</sup>"Remainder" means the five other organs or tissues with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, and upper large intestine). The weighting factor for each remaining organ or tissue is 0.06.</p> <p><sup>2</sup>For the case of uniform external irradiation of the whole body, a weighting factor (<math>w_T</math>) equal to 1 may be used in determination of the effective dose equivalent.</p>	<p><u>Weighting factor</u> (<math>w_T</math>) means the fraction of the overall health risk, resulting from uniform, whole body irradiation, attributable to specific tissue (T). The dose equivalent to tissue, (<math>H_T</math>), is multiplied by the appropriate weighting factor to obtain the effective dose equivalent contribution from that tissue. The weighting factors are as follows:</p> <p style="text-align: center;">WEIGHTING FACTORS FOR VARIOUS ORGANS AND TISSUES [Table unchanged and omitted for brevity]</p> <p><sup>1</sup>"Remainder" means the five other organs or tissues, excluding the skin and lens of the eye, with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, and upper large intestine). The weighting factor for each remaining organ or tissue is 0.06.</p> <p><sup>2</sup>For the case of uniform external irradiation of the whole body, a weighting factor (<math>w_T</math>) equal to 1 may be used in determination of the effective dose equivalent.</p>
<p><u>Whole body</u> means, for the purposes of external exposure, head, trunk (including male gonads), arms above and including the elbow, or legs above and including the knee.</p>	<p><u>Whole body</u> means, for the purposes of external exposure, head, trunk (including male gonads), arms above and including the elbow, or legs above and including the knee.</p>
<p>(c) Terms defined in the Atomic Energy Act and not defined in this part are used consistent with the meanings given in the Act.</p>	<p>(c) Terms defined in the Atomic Energy Act and not defined in this part are used consistent with the meanings given in the Act.</p>



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(d) As used in this part, words in the singular also include the plural and words in the masculine gender also include the feminine and vice versa, as the case may be.	
§ 835.3 General rule.	§ 835.3 General rule.
(a) No person or DOE personnel shall take or cause to be taken any action inconsistent with the requirements of: (1) This part; or (2) Any program, plan, schedule, or other process established by this part.	(a) No person or DOE personnel shall take or cause to be taken any action inconsistent with the requirements of: (1) This part; or (2) Any program, plan, schedule, or other process established by this part.
(b) With respect to a particular DOE activity, contractor management shall be responsible for compliance with the requirements of this part.	(b) With respect to a particular DOE activity, contractor management shall be responsible for compliance with the requirements of this part.
(c) Where there is no contractor for a DOE activity, DOE shall ensure implementation of and compliance with the requirements of this part.	(c) Where there is no contractor for a DOE activity, DOE shall ensure implementation of and compliance with the requirements of this part.
(d) Nothing in this part shall be construed as limiting actions that may be necessary to protect health and safety.	(d) Nothing in this part shall be construed as limiting actions that may be necessary to protect health and safety.
	(e) For those activities that are required by §§ 835.102, 835.901(e), 835.1202(a), and 835.1202(b), the time interval to conduct these activities may be extended by a period not to exceed 30 days to accommodate scheduling needs.
<p>§ 835.4 Radiological units.</p> <p>Unless otherwise specified, the quantities used in the records required by this part shall be clearly indicated in special units of curie, rad, or rem, including multiples and subdivisions of these units. The SI units, becquerel (Bq), gray (Gy), and sievert (Sv), are only provided parenthetically in this part for reference with scientific standards. These SI units are not authorized for use in records required under this part.</p>	<p>§ 835.4 Radiological units.</p> <p>Unless otherwise specified, the quantities used in the records required by this part shall be clearly indicated in special units of curie, rad, roentgen, or rem, including multiples and subdivisions of these units. The SI units, becquerel (Bq), gray (Gy), and sievert (Sv), are only provided parenthetically in this part for reference with scientific standards.</p>
Subpart B--Radiation Protection Programs	Subpart B-Management and Administrative Requirements
§ 835.101 Radiation protection programs.	§ 835.101 Radiation protection programs.
(a) A DOE activity shall be conducted in compliance with a documented radiation protection program (RPP) as approved by the DOE.	(a) A DOE activity shall be conducted in compliance with a documented radiation protection program (RPP) as approved by the DOE.
(b) The DOE may direct or make modifications to a RPP.	(b) The DOE may direct or make modifications to a RPP.
(c) The content of each RPP shall be commensurate with the nature of the activities performed and shall include formal plans and measures for applying the as low as reasonably achievable (ALARA) process to occupational exposure.	(c) The content of each RPP shall be commensurate with the nature of the activities performed and shall include formal plans and measures for applying the as low as reasonably achievable (ALARA) process to occupational exposure.

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(d) The RPP shall specify the existing and/or anticipated operational tasks that are intended to be within the scope of the RPP. Except as provided in § 835.101(i), any task outside the scope of a RPP shall not be initiated until an update of the RPP is approved by DOE.	(d) The RPP shall specify the existing and/or anticipated operational tasks that are intended to be within the scope of the RPP. Except as provided in § 835.101(h), any task outside the scope of a RPP shall not be initiated until an update of the RPP is approved by DOE.
(e) The content of the RPP shall address, but shall not necessarily be limited to, each requirement in this part.	(e) The content of the RPP shall address, but shall not necessarily be limited to, each requirement in this part.
(f) The RPP shall include plans, schedules, and other measures for achieving compliance with regulations of this part. Compliance with this part shall be achieved no later than January 1, 1996.	(f) The RPP shall include plans, schedules, and other measures for achieving compliance with regulations of this part. Unless otherwise specified in this part, compliance with amendments to this part shall be achieved no later than 180 days following approval of the revised RPP by DOE. Compliance with the requirements of § 835.402(d) for radiobioassay program accreditation shall be achieved no later than January 1, 2002.
(g) The RPP for an existing activity shall be submitted to DOE no later than January 1, 1995.	
(h) An update of the RPP shall be submitted to DOE: (1) Whenever a change or an addition to the RPP is made; (2) Prior to the initiation of a task not within the scope of the RPP; or (3) Within 180 days of the effective date of any modifications to this part.	(g) An update of the RPP shall be submitted to DOE: (1) Whenever a change or an addition to the RPP is made; (2) Prior to the initiation of a task not within the scope of the RPP; or (3) Within 180 days of the effective date of any modifications to this part.
(i) Changes, additions, or updates to the RPP may become effective without prior Department approval only if the changes do not decrease the effectiveness of the RPP and the RPP, as changed, continues to meet the requirements of this part. Proposed changes that decrease the effectiveness of the RPP shall not be implemented without submittal to and approval by the Department.	(h) Changes, additions, or updates to the RPP may become effective without prior Department approval only if the changes do not decrease the effectiveness of the RPP and the RPP, as changed, continues to meet the requirements of this part. Proposed changes that decrease the effectiveness of the RPP shall not be implemented without submittal to and approval by the Department.
(j) An initial RPP or an update shall be considered approved 180 days after its submission unless rejected by DOE at an earlier date.	(I) An initial RPP or an update shall be considered approved 180 days after its submission unless rejected by DOE at an earlier date.
§ 835.102 Internal audits.  Internal audits of all functional elements of the radiation protection program shall be conducted no less frequently than every 3 years and shall include program content and implementation.	§ 835.102 Internal audits.  Internal audits of the radiation protection program, including examination of program content and implementation, shall be conducted through a process that ensures that all functional elements are reviewed no less frequently than every 36 months.
	§ 835.103 Education, Training and Skills.  Individuals responsible for developing and implementing measures necessary for ensuring compliance with the requirements of this part shall have the appropriate education, training, and skills to discharge these responsibilities.

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	<p>§ 835.104 Written Procedures.</p> <p>Written procedures shall be developed and implemented as necessary to ensure compliance with this part, commensurate with the radiological hazards created by the activity and consistent with the education, training, and skills of the individuals exposed to those hazards.</p>
<p>Subpart C--Standards for Internal and External Exposure</p> <p>§ 835.201 [Reserved]</p>	<p>Subpart C--Standards for Internal and External Exposure</p> <p>§ 835.201 [Reserved]</p>
<p>§ 835.202 Occupational exposure limits for general employees.</p> <p>(a) The occupational exposure to general employees resulting from DOE activities, other than planned special exposures under § 835.204 and emergency exposure situations under § 835.1302, shall be controlled so the following annual limits are not exceeded:</p> <p>(1) A total effective dose equivalent of 5 rems (0.05 sievert);</p> <p>(2) The sum of the deep dose equivalent for external exposures and the committed dose equivalent to any organ or tissue other than the lens of the eye of 50 rems (0.5 sievert);</p> <p>(3) A lens of the eye dose equivalent of 15 rems (0.15 sievert); and</p> <p>(4) A shallow dose equivalent of 50 rems (0.5 sievert) to the skin or to any extremity.</p>	<p>§ 835.202 Occupational dose limits for general employees.</p> <p>(a) Except for planned special exposures conducted consistent with § 835.204 and emergency exposures authorized in accordance with § 835.1302, the occupational dose received by general employees shall be controlled such that the following limits are not exceeded in a year:</p> <p>(1) A total effective dose equivalent of 5 rems (0.05 sievert);</p> <p>(2) The sum of the deep dose equivalent for external exposures and the committed dose equivalent to any organ or tissue other than the lens of the eye of 50 rems (0.5 sievert);</p> <p>(3) A lens of the eye dose equivalent of 15 rems (0.15 sievert); and</p> <p>(4) A shallow dose equivalent of 50 rems (0.5 sievert) to the skin or to any extremity.</p>
<p>(b) All occupational exposure received during the current year shall be included when demonstrating compliance with § 835.202(a).</p>	<p>(b) All occupational doses received during the current year, except doses resulting from planned special exposures conducted in compliance with § 835.204 and emergency exposures authorized in accordance with § 835.1302, shall be included when demonstrating compliance with §§ 835.202(a) and 835.207.</p>
<p>(c) Exposures from background, therapeutic and diagnostic medical radiation, and voluntary participation in medical research programs shall not be included in dose records or in the assessment of compliance with the occupational exposure limits.</p>	<p>(c) Doses from background, therapeutic and diagnostic medical radiation, and participation as a subject in medical research programs shall not be included in dose records or in the assessment of compliance with the occupational dose limits.</p>
<p>§ 835.203 Combining internal and external dose equivalents resulting from DOE activities.</p> <p>(a) The total effective dose equivalent during a year shall be determined by summing the effective dose equivalent from external exposures and the committed effective dose equivalent from intakes during the year. For purposes of compliance with this part, deep dose equivalent to the whole body may be used as effective dose equivalent for external exposures.</p>	<p>§ 835.203 Combining internal and external dose equivalents.</p> <p>(a) The total effective dose equivalent during a year shall be determined by summing the effective dose equivalent from external exposures and the committed effective dose equivalent from intakes during the year.</p>
<p>(b) Determinations of the effective dose equivalent shall be made using the weighting factor values provided in § 835.2.</p>	<p>(b) Determinations of the effective dose equivalent shall be made using the weighting factor values provided in § 835.2.</p>
<p>(c) For the case of uniform external irradiation of the whole body, a weighting factor (<math>w_T</math>) equal to 1 may be used in the determination of the effective dose equivalent.</p>	

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<p>§ 835.204 Planned special exposures.</p> <p>(a) A planned special exposure may be authorized for a radiological worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in § 835.202(a), provided that each of the following conditions is satisfied:</p> <p>(1) The planned special exposure is considered only in an exceptional situation when alternatives that might prevent a radiological worker from exceeding the limit in § 835.202(a)(1) are unavailable or impractical;</p> <p>(2) The contractor management (and employer, if the employer is not the contractor) specifically requests the planned special exposure, in writing; and</p> <p>(3) Joint written approval from the appropriate DOE Headquarters program office and the Assistant Secretary for Environment, Safety and Health is received.</p>	<p>§ 835.204 Planned special exposures.</p> <p>(a) A planned special exposure may be authorized for a radiological worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in § 835.202(a), provided that each of the following conditions is satisfied:</p> <p>(1) The planned special exposure is considered only in an exceptional situation when alternatives that might prevent a radiological worker from exceeding the limits in § 835.202(a) are unavailable or impractical;</p> <p>(2) The contractor management (and employer, if the employer is not the contractor) specifically requests the planned special exposure, in writing; and</p> <p>(3) Joint written approval is received from the appropriate DOE Headquarters program office and the Secretarial Officer responsible for environment, safety and health matters.</p>
<p>(b) Prior to requesting an individual to participate in an authorized planned special exposure, the individual's dose from all previous planned special exposures and all doses in excess of the occupational dose limits shall be determined.</p>	<p>(b) Prior to requesting an individual to participate in an authorized planned special exposure, the individual's dose from all previous planned special exposures and all doses in excess of the occupational dose limits shall be determined.</p>
<p>(c) An individual shall not receive a planned special exposure that, in addition to the doses determined in § 835.204(b), would result in a dose exceeding the following:</p> <p>(1) A total effective dose equivalent of 5 rems (0.05 sievert) in the current year; and</p> <p>(2) A cumulative total effective dose equivalent of 25 rems (0.25 sievert).</p>	<p>(c) An individual shall not receive a planned special exposure that, in addition to the doses determined in § 835.204(b), would result in a dose exceeding the following:</p> <p>(1) In a year, the numerical values of the dose limits established at § 835.202(a); and</p> <p>(2) Over the individual's lifetime, five times the numerical values of the dose limits established at § 835.202(a).</p>
<p>(d) Prior to a planned special exposure, written consent shall be obtained from each individual involved. Each individual shall be:</p> <p>(1) Informed of the purpose of the planned operations and procedures to be used;</p> <p>(2) Informed of the estimated doses and associated potential risks and specific radiological conditions and other hazards which might be involved in performing the task; and</p> <p>(3) Instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.</p>	<p>(d) Prior to a planned special exposure, written consent shall be obtained from each individual involved. Each such written consent shall include:</p> <p>(1) The purpose of the planned operations and procedures to be used;</p> <p>(2) The estimated doses and associated potential risks and specific radiological conditions and other hazards which might be involved in performing the task; and</p> <p>(3) Instructions on the measures to be taken to keep the dose ALARA considering other risks that may be present.</p>
<p>(e) Records of the conduct of a planned special exposure shall be maintained and a written report submitted within 30 days after the planned special exposure to the approving organizations identified in § 835.204(a)(3).</p>	<p>(e) Records of the conduct of a planned special exposure shall be maintained and a written report submitted within 30 days after the planned special exposure to the approving organizations identified in § 835.204(a)(3).</p>
<p>(f) The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual under § 835.202(a), but is to be included in records and reports required under this part.</p>	<p>(f) The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual under § 835.202(a), but is to be included in records and reports required under this part.</p>

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<p>§ 835.205 Determination of compliance for non-uniform exposure of the skin.</p> <p>(a) Non-uniform exposures of the skin from X-rays, beta radiation, and/or radioactive material on the skin are to be assessed as specified in this section.</p> <p>(b) For purposes of demonstrating compliance with § 835.202(a)(4), assessments shall be conducted as follows:</p> <p>(1) <u>Area of skin irradiated is 100 cm<sup>2</sup> or more.</u> The non-uniform dose equivalent received during the year shall be averaged over the 100 cm<sup>2</sup> of the skin receiving the maximum dose, added to any uniform dose equivalent also received by the skin, and recorded as the shallow dose equivalent to any extremity or skin for the year.</p>	<p>§ 835.205 Determination of compliance for non-uniform exposure of the skin.</p> <p>(a) Non-uniform exposures of the skin from X-rays, beta radiation, and/or radioactive material on the skin are to be assessed as specified in this section.</p> <p>(b) For purposes of demonstrating compliance with § 835.202(a)(4), assessments shall be conducted as follows:</p> <p>(1) <u>Area of skin irradiated is 100 cm<sup>2</sup> or more.</u> The non-uniform dose equivalent received during the year shall be averaged over the 100 cm<sup>2</sup> of the skin receiving the maximum dose, added to any uniform dose equivalent also received by the skin, and recorded as the shallow dose equivalent to any extremity or skin for the year.</p>
<p>(2) <u>Area of skin irradiated is 10 cm<sup>2</sup> or more, but is less than 100 cm<sup>2</sup>.</u> The non-uniform dose equivalent (H) to the irradiated area received during the year shall be added to any uniform dose equivalent also received by the skin and recorded as the shallow dose equivalent to any extremity or skin for the year. H is the dose equivalent averaged over the 1 cm<sup>2</sup> of skin receiving the maximum absorbed dose, D, reduced by the fraction f, which is the irradiated area in cm<sup>2</sup> divided by 100 cm<sup>2</sup> (i.e., <math>H = fD</math>). In no case shall a value of f less than 0.1 be used.</p> <p>(3) <u>Area of skin irradiated is less than 10 cm<sup>2</sup>.</u> The non-uniform dose equivalent shall be averaged over the 1 cm<sup>2</sup> of skin receiving the maximum dose. This dose equivalent shall:</p> <p>(i) Be recorded in the individual's occupational exposure history as a special entry; and</p> <p>(ii) Not be added to any other shallow dose equivalent to any extremity or skin recorded as the dose equivalent for the year.</p>	<p>(2) <u>Area of skin irradiated is 10 cm<sup>2</sup> or more, but is less than 100 cm<sup>2</sup>.</u> The non-uniform dose equivalent (H) to the irradiated area received during the year shall be added to any uniform dose equivalent also received by the skin and recorded as the shallow dose equivalent to any extremity or skin for the year. H is the dose equivalent averaged over the 1 cm<sup>2</sup> of skin receiving the maximum absorbed dose, D, reduced by the fraction f, which is the irradiated area in cm<sup>2</sup> divided by 100 cm<sup>2</sup> (i.e., <math>H = fD</math>). In no case shall a value of f less than 0.1 be used.</p> <p>(3) <u>Area of skin irradiated is less than 10 cm<sup>2</sup>.</u> The non-uniform dose equivalent shall be averaged over the 1 cm<sup>2</sup> of skin receiving the maximum dose. This dose equivalent shall:</p> <p>(i) Be recorded in the individual's occupational exposure history as a special entry; and</p> <p>(ii) Not be added to any other shallow dose equivalent to any extremity or skin recorded as the dose equivalent for the year.</p>
<p>§ 835.206 Limits for the embryo/fetus.</p> <p>(a) The dose equivalent limit for the embryo/fetus from the period of conception to birth, as a result of occupational exposure of a declared pregnant worker, is 0.5 rem (0.005 sievert).</p> <p>(b) Substantial variation above a uniform exposure rate that would satisfy the limits provided in § 835.206(a) shall be avoided.</p> <p>(c) If the dose equivalent to the embryo/fetus is determined to have already exceeded 0.5 rem (0.005 sievert) by the time a worker declares her pregnancy, the declared pregnant worker shall not be assigned to tasks where additional occupational exposure is likely during the remaining gestation period.</p>	<p>§ 835.206 Limits for the embryo/fetus.</p> <p>(a) The dose equivalent limit for the embryo/fetus from the period of conception to birth, as a result of occupational exposure of a declared pregnant worker, is 0.5 rem (0.005 sievert).</p> <p>(b) Substantial variation above a uniform exposure rate that would satisfy the limits provided in § 835.206(a) shall be avoided.</p> <p>(c) If the dose equivalent to the embryo/fetus is determined to have already exceeded 0.5 rem (0.005 sievert) by the time a worker declares her pregnancy, the declared pregnant worker shall not be assigned to tasks where additional occupational exposure is likely during the remaining gestation period.</p>
<p>§ 835.207 Limits for minors.</p> <p>Any minor exposed to radiation and/or radioactive material during direct on-site access at a DOE site or facility shall not exceed 0.1 rem (0.001 sievert) total effective dose equivalent in a year.</p>	<p><b>§ 835.207 Occupational dose limits for minors.</b></p> <p><b>The dose equivalent limits for minors occupationally exposed to radiation and/or radioactive materials at a DOE activity are 0.1 rem (0.001 sievert) total effective dose equivalent in a year and 10% of the occupational dose limits specified at § 835.202(a)(3) and (a)(4).</b></p>

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<p>§ 835.208 Limits for members of the public entering a controlled area.</p> <p>Any member of the public exposed to radiation and/or radioactive material during access at a DOE site or facility shall not exceed 0.1 rem (0.001 sievert) total effective dose equivalent in a year.</p>	<p>§ 835.208 Limits for members of the public entering a controlled area.</p> <p><b>The total effective dose equivalent limit for members of the public exposed to radiation and/or radioactive material during access to a controlled area is 0.1 rem (0.001 sievert) in a year.</b></p>
<p>§ 835.209 Concentrations of radioactive material in air.</p> <p>(a) The derived air concentration (DAC) values given in appendices A and C to this part shall be used in the control of occupational exposures to airborne radioactive material.</p>	<p>§ 835.209 Concentrations of radioactive material in air.</p> <p>(a) The derived air concentration (DAC) values given in appendices A and C <b>of</b> this part shall be used in the control of occupational exposures to airborne radioactive material.</p>
<p>(b) With regard to inhalation exposures and external exposures from airborne radionuclides, compliance with this part shall be demonstrated through conformity with § 835.101 and § 835.202 which establishes the applicable regulatory limits.</p>	
<p>(c) The estimation of internal dose shall be based on bioassay data rather than air concentration values unless bioassay data are:</p> <ol style="list-style-type: none"> <li>(1) unavailable;</li> <li>(2) inadequate; or</li> <li>(3) internal dose estimates based on representative air concentration values are demonstrated to be as or more accurate.</li> </ol>	<p><b>(b)</b> The estimation of internal dose shall be based on bioassay data rather than air concentration values unless bioassay data are:</p> <ol style="list-style-type: none"> <li>(1) unavailable;</li> <li>(2) inadequate; or</li> <li>(3) internal dose estimates based <b>on air concentration values</b> are demonstrated to be as or more accurate.</li> </ol>
<p>Subpart D--[Reserved]</p> <p>Subpart E--Monitoring in the Workplace</p>	<p>Subpart D--[Reserved]</p> <p>Subpart E--<b>Monitoring of Individuals and Areas</b></p>
<p>§ 835.401 General requirements.</p> <p>(a) Monitoring of individuals and areas shall be performed to:</p> <ol style="list-style-type: none"> <li>(1) Demonstrate compliance with the regulations in this part;</li> <li>(2) Document radiological conditions in the workplace;</li> <li>(3) Detect changes in radiological conditions;</li> <li>(4) Detect the gradual buildup of radioactive material in the workplace; and</li> <li>(5) Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure.</li> </ol>	<p>§ 835.401 General requirements.</p> <p>(a) <b>Monitoring of individuals and areas shall be performed to:</b></p> <ol style="list-style-type: none"> <li>(1) Demonstrate compliance with the regulations in this part;</li> <li>(2) <b>Document radiological conditions;</b></li> <li>(3) Detect changes in radiological conditions;</li> <li>(4) <b>Detect the gradual buildup of radioactive material;</b></li> <li>(5) <b>Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure; and</b></li> </ol>
<p>(b) Area monitoring in the workplace shall be routinely performed, as necessary, to identify and control potential sources of personnel exposure to radiation and/or radioactive material.</p>	<p><b>(6) Identify and control potential sources of individual exposure to radiation and/or radioactive material.</b></p>
<p>(c) Instruments used for monitoring and contamination control shall be:</p> <ol style="list-style-type: none"> <li>(1) Periodically maintained and calibrated on an established frequency of at least once per year;</li> <li>(2) Appropriate for the type(s), levels, and energies of the radiation(s) encountered;</li> <li>(3) Appropriate for existing environmental conditions; and</li> <li>(4) Routinely tested for operability.</li> </ol>	<p><b>(b) Instruments and equipment used for monitoring shall be:</b></p> <ol style="list-style-type: none"> <li><b>(1) Periodically maintained and calibrated on an established frequency;</b></li> <li>(2) Appropriate for the type(s), levels, and energies of the radiation(s) encountered;</li> <li>(3) Appropriate for existing environmental conditions; and</li> <li>(4) Routinely tested for operability.</li> </ol>

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<p>§ 835.402 Individual monitoring.</p> <p>(a) For the purpose of monitoring individual exposures to external radiation, personnel dosimetry shall be provided to and used by:</p> <p>(1) Radiological workers who, under typical conditions, are likely to receive one or more of the following:</p> <p>(i) An effective dose equivalent to the whole body of 0.1 rem (0.001 sievert) or more in a year;</p> <p>(ii) A shallow dose equivalent to the skin or to any extremity of 5 rems (0.05 sievert) or more in a year;</p> <p>(iii) A lens of the eye dose equivalent of 1.5 rems (0.015 sievert) or more in a year;</p> <p>(iv) A deep dose equivalent from external exposures to any organ or tissue other than the lens of the eye of 5 rems (0.05 sievert);</p> <p>(2) Declared pregnant workers who are likely to receive from external sources a dose equivalent to the embryo/fetus in excess of 10 percent of the applicable limit in § 835.206;</p> <p>(3) Minors and members of the public likely to receive, in 1 year, from external sources, a dose in excess of 50 percent of the applicable limits in § 835.207 or § 835.208, respectively; or</p> <p>(4) Individuals entering a high or very high radiation area.</p>	<p>§ 835.402 Individual monitoring.</p> <p>(a) For the purpose of monitoring individual exposures to external radiation, personnel dosimeters shall be provided to and used by:</p> <p>(1) Radiological workers who, under typical conditions, are likely to receive one or more of the following:</p> <p>(i) An effective dose equivalent to the whole body of 0.1 rem (0.001 sievert) or more in a year;</p> <p>(ii) A shallow dose equivalent to the skin or to any extremity of 5 rems (0.05 sievert) or more in a year;</p> <p>(iii) A lens of the eye dose equivalent of 1.5 rems (0.015 sievert) or more in a year;</p> <p>(2) Declared pregnant workers who are likely to receive from external sources a dose equivalent to the embryo/fetus in excess of 10 percent of the applicable limit at § 835.206(a);</p> <p>(3) Occupationally exposed minors likely to receive a dose in excess of 50 percent of the applicable limits at § 835.207 in a year from external sources;</p> <p>(4) Members of the public entering a controlled area likely to receive a dose in excess of 50 percent of the limit at § 835.208 in a year from external sources; and</p> <p>(5) Individuals entering a high or very high radiation area.</p>
<p>(b) Personnel external dosimetry programs shall be adequate to demonstrate compliance with § 835.202, including routine dosimeter calibration and conformance with the requirements of the DOE Laboratory Accreditation Program for Personnel Dosimetry.</p>	<p>(b) External dose monitoring programs implemented to demonstrate compliance with § 835.402(a) shall be adequate to demonstrate compliance with the dose limits established in subpart C of this part and shall be:</p> <p>(1) Accredited, or excepted from accreditation, in accordance with the DOE Laboratory Accreditation Program for Personnel Dosimetry; or</p> <p>(2) Determined by the Secretarial Officer responsible for environment, safety and health matters to have performance substantially equivalent to that of programs accredited under the DOE Laboratory Accreditation Program for Personnel Dosimetry.</p>
<p>(c) For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for:</p> <p>(1) Radiological workers who, under typical conditions, are likely to receive 0.1 rem (0.001 sievert) or more committed effective dose equivalent, and/or 5 rems (0.05 sievert) or more committed dose equivalent to any organ or tissue, from all occupational radionuclide intakes in a year;</p> <p>(2) Declared pregnant workers likely to receive an intake resulting in a dose equivalent to the embryo/fetus in excess of 10 percent of the limit stated in § 835.206; or</p> <p>(3) Minors and members of the public who are likely to receive, in 1 year, an intake resulting in a committed effective dose equivalent in excess of 50 percent of the limits stated in § 835.207 or § 835.208, respectively.</p>	<p>(c) For the purpose of monitoring individual exposures to internal radiation, internal dosimetry programs (including routine bioassay programs) shall be conducted for:</p> <p>(1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of 0.1 rem (0.001 sievert) or more from all occupational radionuclide intakes in a year;</p> <p>(2) Declared pregnant workers likely to receive an intake or intakes resulting in a dose equivalent to the embryo/fetus in excess of 10 percent of the limit stated at § 835.206(a);</p> <p>(3) Occupationally exposed minors who are likely to receive a dose in excess of 50 percent of the applicable limit stated at § 835.207 from all radionuclide intakes in a year; or</p> <p>(4) Members of the public entering a controlled area likely to receive a dose in excess of 50 percent of the limit stated at § 835.208 from all radionuclide intakes in a year.</p>



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<p>(d) Internal dose evaluation programs shall be adequate to demonstrate compliance with § 835.202.</p>	<p>(d) Internal dose monitoring programs implemented to demonstrate compliance with § 835.402(c) shall be adequate to demonstrate compliance with the dose limits established in subpart C of this part and shall be:</p> <p>(1) Accredited, or excepted from accreditation, in accordance with the DOE Laboratory Accreditation Program for Radiobioassay; or</p> <p>(2) Determined by the Secretarial Officer responsible for environment, safety and health matters to have performance substantially equivalent to that of programs accredited under the DOE Laboratory Accreditation Program for Radiobioassay.</p>
<p>§ 835.403 Area monitoring.</p> <p>(a) Measurements of radioactivity concentrations in the ambient air of the workplace shall be performed as follows:</p> <p>(1) Air sampling shall be performed in occupied areas where, under typical conditions, an individual is likely to receive an annual intake of 2 percent or more of the specified ALI values. For a given radionuclide and lung retention class, the ALI is the product of the DAC listed in appendix A of this part and the constant <math>2.4 \times 10^9</math> ml. Samples shall be taken as necessary to detect and evaluate the level or concentration of airborne radioactive material at work locations.</p> <p>(2) Real-time air monitoring, using continuous air monitors as defined in § 835.2, shall be performed in normally occupied areas where an individual is likely to be exposed to a concentration of airborne radioactivity exceeding 1 DAC as specified in appendix A of this part or where there is a need to alert potentially exposed individuals to unexpected increases in airborne radioactivity levels.</p> <p>(3) For the airborne radioactive material that could be encountered, real-time air monitors shall have alarm capability and sufficient sensitivity to alert potentially exposed individuals that immediate action is necessary in order to minimize or terminate inhalation exposures.</p>	<p>§ 835.403 Air monitoring.</p> <p>(a) Monitoring of airborne radioactivity shall be performed:</p> <p>(1) Where an individual is likely to receive an exposure of 40 or more DAC-hours in a year; or</p> <p>(2) As necessary to characterize the airborne radioactivity hazard where respiratory protective devices for protection against airborne radionuclides have been prescribed.</p> <p>(b) Real-time air monitoring shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material.</p>
<p>(b) Monitoring of radiation in the workplace shall be performed using stationary (area) or portable radiation instruments, or a combination thereof. The instruments shall be readily available and shall be capable of measuring ambient radiation dose rates for the purpose of controlling radiation exposures.</p>	
<p>§ 835.404 Note: Relocated to § 835.1102 for ease of comparison</p>	<p>§ 835.404 [Reserved]</p>
	<p>§ 835.405 Receipt of packages containing radioactive material.</p> <p>(a) If packages containing quantities of radioactive material in excess of a Type A quantity (as defined at 10 CFR 71.4) are expected to be received from radioactive material transportation, arrangements shall be made to either:</p> <p>(1) Take possession of the package when the carrier offers it for delivery; or</p> <p>(2) Receive notification as soon as practicable after arrival of the package at the carrier's terminal and to take possession of the package expeditiously after receiving such notification.</p>

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	<p>(b) Upon receipt from radioactive material transportation, external surfaces of packages known to contain radioactive material shall be monitored if the package:</p> <p>(1) Is labeled with a Radioactive White I, Yellow II, or Yellow III label (as specified at 49 CFR 172.403 and 172.436-440); or</p> <p>(2) Has been transported as low specific activity material (as defined at 10 CFR 71.4) on an exclusive use vehicle (as defined at 10 CFR 71.4); or</p> <p>(3) Has evidence of degradation, such as packages that are crushed, wet, or damaged.</p>
	<p>(c) The monitoring required by paragraph (b) of this section shall include:</p> <p>(1) Measurements of removable contamination levels, unless the package contains only special form (as defined at 10 CFR 71.4) or gaseous radioactive material; and</p> <p>(2) Measurements of the radiation levels, unless the package contains less than a Type A quantity (as defined at 10 CFR 71.4) of radioactive material.</p>
	<p>(d) The monitoring required by paragraph (b) of this section shall be completed as soon as practicable following receipt of the package, but not later than 8 hours after the beginning of the working day following receipt of the package.</p>
<p>Subpart F--Entry Control Program</p> <p>§ 835.501 Radiological areas.</p> <p>(a) Personnel entry control shall be maintained for each radiological area.</p>	<p>Subpart F--Entry Control Program</p> <p>§ 835.501 Radiological areas.</p> <p>(a) Personnel entry control shall be maintained for each radiological area.</p>
<p>(b) The degree of control shall be commensurate with existing and potential radiological hazards within the area.</p>	<p>(b) The degree of control shall be commensurate with existing and potential radiological hazards within the area.</p>
<p>(c) One or more of the following methods shall be used to ensure control:</p> <p>(1) Signs and barricades;</p> <p>(2) Control devices on entrances;</p> <p>(3) Conspicuous visual and/or audible alarms;</p> <p>(4) Locked entrance ways; or</p> <p>(5) Administrative controls.</p>	<p>(c) One or more of the following methods shall be used to ensure control:</p> <p>(1) Signs and barricades;</p> <p>(2) Control devices on entrances;</p> <p>(3) Conspicuous visual and/or audible alarms;</p> <p>(4) Locked entrance ways; or</p> <p>(5) Administrative controls.</p>
<p>(d) Administrative procedures shall be written as necessary to demonstrate compliance with the provisions of this section. These administrative procedures shall include actions essential to ensure the effectiveness and operability of barricades, devices, alarms, and locks. Authorizations shall be required to perform specific work within the area and shall include specific radiation protection measures.</p>	<p>(d) Written authorizations shall be required to control entry into and perform work within radiological areas. These authorizations shall specify radiation protection measures commensurate with the existing and potential hazards.</p>
<p>(e) No control(s) shall be installed at any radiological area exit that would prevent rapid evacuation of personnel under emergency conditions.</p>	<p>(e) No control(s) shall be installed at any radiological area exit that would prevent rapid evacuation of personnel under emergency conditions.</p>

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<p>§ 835.502 High and very high radiation areas.</p>	<p>§ 835.502 High and very high radiation areas.</p> <p>(a) The following measures shall be implemented for each entry into a high radiation area:            (1) The area shall be monitored as necessary during access to determine the exposure rates to which the individuals are exposed; and            (2) Each individual shall be monitored by a supplemental dosimetry device or other means capable of providing an immediate estimate of the individual's integrated deep dose equivalent during the entry.</p>
<p>(a) <u>High radiation areas</u>. One or more of the following features shall be used for each entrance or access point to a high radiation area where radiation levels exist such that an individual could exceed a deep dose equivalent to the whole body of 1 rem (0.01 sievert) in any one hour at 30 centimeters from the source or from any surface that the radiation penetrates:</p> <p>(1) A control device that prevents entry to the area when high radiation levels exist or upon entry causes the radiation level to be reduced below that level defining a high radiation area;</p> <p>(2) A device that functions automatically to prevent use or operation of the radiation source or field while personnel are in the area;</p> <p>(3) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry;</p> <p>(4) Entryways that are locked. During periods when access to the area is required, positive control over each entry is maintained;</p> <p>(5) Continuous direct or electronic surveillance that is capable of preventing unauthorized entry;</p> <p>(6) A control device that will automatically generate audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the area or activation of a secondary control device that will prevent use or operation of the source.</p>	<p>(b) <u>Physical controls</u>. One or more of the following controls shall be used for each entrance or access point to a high radiation area where radiation levels exist such that an individual could exceed a deep dose equivalent to the whole body of 1 rem (0.01 sievert) in any one hour at 30 centimeters from the source or from any surface that the radiation penetrates:</p> <p>(1) A control device that prevents entry to the area when high radiation levels exist or that, upon entry, causes the radiation level to be reduced below the level that defines a high radiation area;</p> <p>(2) A device that functions automatically to prevent use or operation of the radiation source or field while individuals are in the area;</p> <p>(3) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry;</p> <p>(4) Entryways that are locked. During periods when access to the area is required, positive control over each entry is maintained;</p> <p>(5) Continuous direct or electronic surveillance that is capable of preventing unauthorized entry;</p> <p>(6) A control device that will automatically generate audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the area or activation of a secondary control device that will prevent use or operation of the source.</p>
<p>(b) <u>Very high radiation areas</u>. In addition to the above requirements, additional measures shall be implemented to ensure individuals are not able to gain access to very high radiation areas when dose rates are in excess of the posting requirements of § 835.603(c).</p>	<p>(c) <u>Very high radiation areas</u>. In addition to the above requirements, additional measures shall be implemented to ensure individuals are not able to gain unauthorized or inadvertent access to very high radiation areas.</p>
<p>(c) No control(s) shall be established in a high or very high radiation area that would prevent rapid evacuation of personnel.</p>	<p>(d) No control(s) shall be established in a high or very high radiation area that would prevent rapid evacuation of personnel.</p>

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<p>Subpart G--Posting and Labeling</p> <p>§ 835.601 General requirements.</p> <p>(a) Working areas that require posting because of the presence, or potential presence, of radiation and/or radioactive material are delineated in the subsequent paragraphs of this section. Radioactive items or containers of radioactive materials, shall be individually labeled if adequate warning is not provided by control measures and required posting.</p>	<p>Subpart G--Posting and Labeling</p> <p>§ 835.601 General requirements.</p> <p><i>Note: See also § 835.605.</i></p>
<p>(b) DOE approved signs, labels, and radiation symbols shall be used to identify areas specified in this subpart.</p>	
<p>(c) Required signs and labels shall have a yellow background. The radiation symbol shall be black or magenta.</p>	<p>(a) Except as otherwise provided in this subpart, postings and labels required by this subpart shall include the standard radiation warning trefoil in black or magenta imposed upon a yellow background.</p>
<p>(d) Signs required by this subpart shall be clear and conspicuously posted and may include radiological protection instructions.</p>	<p>(b) Signs required by this subpart shall be clearly and conspicuously posted and may include radiological protection instructions.</p>
<p>(e) The posting requirements in this section may be modified to reflect the special considerations of DOE activities conducted at private residences. Such modifications shall provide the same level of protection to individuals as the existing provisions in this section.</p>	<p>(c) The posting and labeling requirements in this subpart may be modified to reflect the special considerations of DOE activities conducted at private residences or businesses. Such modifications shall provide the same level of protection to individuals as the existing provisions in this subpart.</p>
<p>§ 835.602 Controlled areas.</p> <p>(a) Each access point to a controlled area (as defined in § 835.2) shall be posted, identifying it as a controlled area, whenever radioactive material and/or radiation fields which would require posting under § 835.603 may be present in the area.</p>	<p>§ 835.602 Controlled areas.</p> <p>(a) Each access point to a controlled area (as defined in § 835.2) shall be posted whenever radiological areas or radioactive material areas exist in the area. Individuals who enter only controlled areas without entering radiological areas or radioactive material areas are not expected to receive a total effective dose equivalent of more than 0.1 rem (0.001 sievert) in a year.</p>
<p>(b) Signs used for this purpose may be selected by the contractor to avoid conflict with local security requirements.</p>	<p>(b) Signs used for this purpose may be selected by the contractor to avoid conflict with local security requirements.</p>
<p>§ 835.603 Radiological areas.</p> <p>Each access point to a radiological area (as defined in § 835.2) shall be posted with conspicuous signs bearing the wording provided in this section.</p> <p>(a) <u>Radiation Area</u>. The words "Caution, Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.005 rem (0.05 millisievert) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates.</p>	<p>§ 835.603 Radiological areas and radioactive material areas.</p> <p>Each access point to radiological areas and radioactive material areas (as defined at § 835.2) shall be posted with conspicuous signs bearing the wording provided in this section.</p> <p>(a) <u>Radiation Area</u>. The words "Caution, Radiation Area" shall be posted at each radiation area.</p>

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(b) <u>High Radiation Area</u> . The words "Danger, High Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (0.001 sievert) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.	(b) <u>High Radiation Area</u> . The words "Caution, High Radiation Area" or "Danger, High Radiation Area" shall be posted at each high radiation area.
(c) <u>Very High Radiation Area</u> . The words "Grave Danger, Very High Radiation Area" shall be posted at any area accessible to individuals in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in one hour at 1 meter from the radiation source or from any surface that the radiation penetrates.	(c) <u>Very High Radiation Area</u> . The words "Grave Danger, Very High Radiation Area" shall be posted at each very high radiation area.
(d) <u>Airborne Radioactivity Area</u> . The words "Caution, Airborne Radioactivity Area" shall be posted for any occupied area in which airborne radioactivity levels exceed, or are likely to exceed, 10 percent of the DAC value listed in appendix A or appendix C of this part.	(d) <u>Airborne Radioactivity Area</u> . The words "Caution, Airborne Radioactivity Area" or "Danger, Airborne Radioactivity Area" shall be posted at each airborne radioactivity area.
(e) <u>Contamination Area</u> . The words "Caution, Contamination Area" shall be posted where contamination levels exceed values listed in appendix D of this part, but are less than or equal to 100 times those values.	(e) <u>Contamination Area</u> . The words "Caution, Contamination Area" shall be posted at each contamination area.
(f) <u>High Contamination Area</u> . The words "Danger, High Contamination Area" shall be posted where contamination levels are greater than 100 times the values listed in appendix D of this part.	(f) <u>High Contamination Area</u> . The words "Caution, High Contamination Area" or "Danger, High Contamination Area" shall be posted at each high contamination area.
	(g) <u>Radioactive Material Area</u> . The words "Caution, Radioactive Material(s)" shall be posted at each radioactive material area.
	<p>§ 835.604 Exceptions to posting requirements.</p> <p>(a) Areas may be excepted from the posting requirements of § 835.603 for periods of less than 8 continuous hours when placed under continuous observation and control of an individual knowledgeable of, and empowered to implement, required access and exposure control measures.</p>
	<p>(b) Areas may be excepted from the radioactive material area posting requirements of § 835.603(g) when:</p> <ol style="list-style-type: none"> <li>(1) Posted in accordance with § 835.603(a) through (f); or</li> <li>(2) Each item or container of radioactive material is labeled in accordance with this subpart such that individuals entering the area are made aware of the hazard; or</li> <li>(3) The radioactive material of concern consists solely of structures or installed components which have been activated (i.e. such as by being exposed to neutron radiation or particles produced in an accelerator).</li> </ol>
	(c) Areas containing only packages received from radioactive material transportation labeled and in non-degraded condition need not be posted in accordance with § 835.603 until the packages are monitored in accordance with § 835.405.

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	<p>§ 835.605 Labeling items and containers.</p> <p>Except as provided in § 835.606, each item or container of radioactive material shall bear a durable, clearly visible label bearing the standard radiation warning trefoil and the words "Caution, Radioactive Material" or "Danger, Radioactive Material." The label shall also provide sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers, to take precautions to avoid or control exposures.</p>
	<p>§ 835.606 Exceptions to labeling requirements.</p> <p>(a) Items and containers may be excepted from the radioactive material labeling requirements of § 835.605 when:</p> <p>(1) Used, handled, or stored in areas posted and controlled in accordance with this subpart and sufficient information is provided to permit individuals to take precautions to avoid or control exposures; or</p>
	<p>(2) The quantity of radioactive material is less than one tenth of the values specified in appendix E of this part; or</p>
	<p>(3) Packaged, labeled, and marked in accordance with the regulations of the Department of Transportation or DOE Orders governing radioactive material transportation; or</p>
	<p>(4) Inaccessible, or accessible only to individuals authorized to handle or use them, or to work in the vicinity; or</p>
	<p>(5) Installed in manufacturing, process, or other equipment, such as reactor components, piping, and tanks.</p>
	<p>(6) The radioactive material consists solely of nuclear weapons or their components.</p>
	<p>(b) Radioactive material labels applied to sealed radioactive sources may be excepted from the color specifications of § 835.601(a).</p>
<p>Subpart H--Records</p> <p>§ 835.701 General provisions.</p> <p>(a) Records shall be maintained to document compliance with this part and with radiation protection programs required by § 835.101.</p> <p>(b) Unless otherwise specified in this subpart, records shall be retained until final disposition is authorized by DOE.</p>	<p>Subpart H--Records</p> <p>§ 835.701 General provisions.</p> <p>(a) Records shall be maintained to document compliance with this part and with radiation protection programs required by § 835.101.</p> <p>(b) Unless otherwise specified in this subpart, records shall be retained until final disposition is authorized by DOE.</p>

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<p>§ 835.702 Individual monitoring records.</p> <p>(a) Records shall be maintained to document doses received by all individuals for whom monitoring was required pursuant to § 835.402 and doses received during planned special exposures, accidents, and emergency conditions.</p>	<p>§ 835.702 Individual monitoring records.</p> <p>(a) Records shall be maintained to document doses received by all individuals for whom monitoring was required pursuant to § 835.402 and to document doses received during planned special exposures, unplanned doses exceeding the monitoring thresholds of § 835.402, and authorized emergency exposures.</p>
<p>(b) The results of individual external and internal dose measurements that are performed, but are not required by § 835.402, shall be recorded. Recording of the non-uniform shallow dose equivalent to the skin caused by contamination on the skin (see § 835.205) is not required if the dose is less than 2 percent of the limit specified for the skin in § 835.202(a)(4).</p>	<p>(b) The results of individual external and internal dose monitoring that is performed, but not required by § 835.402, shall be recorded. Recording of the non-uniform shallow dose equivalent to the skin is not required if the dose is less than 2 percent of the limit specified for the skin at § 835.202(a)(4).</p>
<p>(c) The records required by this section shall:</p> <p>(1) Be sufficient to evaluate compliance with § 835.202;</p> <p>(2) Be sufficient to provide dose information necessary to complete reports required by subpart I of this part and by Departmental requirements for occurrence reporting and processing;</p> <p>(3) Include the following quantities for external dose received during the year:</p> <p>(i) The effective dose equivalent from external sources of radiation (deep dose equivalent may be used as effective dose equivalent for external exposure);</p> <p>(ii) The lens of the eye dose equivalent;</p> <p>(iii) The shallow dose equivalent to the skin; and</p> <p>(iv) The shallow dose equivalent to the extremities.</p> <p>(4) Include the following quantities for internal dose resulting from intakes received during the year:</p> <p>(i) Committed effective dose equivalent;</p> <p>(ii) Committed dose equivalent to any organ or tissue of concern; and</p> <p>(iii) Estimated intake and identity of radionuclides.</p> <p>(5) Include the following quantities for the summation of the external and internal dose:</p> <p>(i) Total effective dose equivalent in a year;</p> <p>(ii) For any organ or tissue assigned an internal dose during the year, the sum of the deep dose equivalent from external exposures and the committed dose equivalent to that organ or tissue; and</p> <p>(iii) Cumulative total effective dose equivalent received from external and internal sources while employed at the site or facility, since January 1, 1989.</p> <p>(6) Include the dose equivalent to the embryo/fetus of a declared pregnant worker.</p>	<p>(c) The records required by this section shall:</p> <p>(1) Be sufficient to evaluate compliance with subpart C of this part;</p> <p>(2) Be sufficient to provide dose information necessary to complete reports required by subpart I of this part;</p> <p>(3) Include the following quantities for external dose received during the year:</p> <p>(i) The effective dose equivalent from external sources of radiation (deep dose equivalent may be used as effective dose equivalent for external exposure);</p> <p>(ii) The lens of the eye dose equivalent;</p> <p>(iii) The shallow dose equivalent to the skin; and</p> <p>(iv) The shallow dose equivalent to the extremities.</p> <p>(4) Include the following information for internal dose resulting from intakes received during the year:</p> <p>(i) Committed effective dose equivalent;</p> <p>(ii) Committed dose equivalent to any organ or tissue of concern; and</p> <p>(iii) Identity of radionuclides.</p> <p>(5) Include the following quantities for the summation of the external and internal dose:</p> <p>(i) Total effective dose equivalent in a year;</p> <p>(ii) For any organ or tissue assigned an internal dose during the year, the sum of the deep dose equivalent from external exposures and the committed dose equivalent to that organ or tissue; and</p> <p>(iii) Cumulative total effective dose equivalent.</p> <p>(6) Include the dose equivalent to the embryo/fetus of a declared pregnant worker.</p>
<p>(d) Documentation of all occupational exposure received during the current year shall be obtained when demonstrating compliance with § 835.202(a). In the absence of formal records of previous occupational exposure during the year, a written estimate signed by the individual may be accepted.</p>	<p>(d) Documentation of all occupational doses received during the current year, except for doses resulting from planned special exposures conducted in compliance with § 835.204 and emergency exposures authorized in accordance with § 835.1302(d), shall be obtained to demonstrate compliance with § 835.202(a). If complete records documenting previous occupational dose during the year cannot be obtained, a written estimate signed by the individual may be accepted to demonstrate compliance.</p>



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(e) Efforts shall be made to obtain records of prior years occupational internal and external exposure.	(e) For radiological workers whose occupational dose is monitored in accordance with § 835.402, reasonable efforts shall be made to obtain complete records of prior years occupational internal and external doses.
(f) The records specified in this section that are identified with a specific individual shall be readily available to that individual. (g) Data necessary to allow future verification or reassessment of the recorded doses shall be recorded. (h) All records required by this section shall be transferred to the DOE upon cessation of activities at the site that could cause exposure to individuals.	(f) The records specified in this section that are identified with a specific individual shall be readily available to that individual. (g) Data necessary to allow future verification or reassessment of the recorded doses shall be recorded. (h) All records required by this section shall be transferred to the DOE upon cessation of activities at the site that could cause exposure to individuals.
§ 835.703 Monitoring and workplace records.  The following information shall be documented and maintained: (a) Results of surveys for radiation and radioactive material in the workplace as required by §§ 835.401, 835.403, and 835.404;	§ 835.703 Other monitoring records.  The following information shall be documented and maintained: (a) Results of monitoring for radiation and radioactive material as required by subparts E and L of this part, except for monitoring required by § 835.1102(d);
(b) Results of surveys, measurements, and calculations used to determine individual occupational exposure from external and internal sources;	(b) Results of monitoring used to determine individual occupational dose from external and internal sources;
(c) Results of surveys for the release of material and equipment as required by § 835.1101(d); and	(c) Results of monitoring for the release and control of material and equipment as required by § 835.1101; and
(d) Results of maintenance and calibration performed on: (1) Instruments used for area monitoring and contamination control as required by § 835.401; and (2) Devices used for individual monitoring as required by §§ 835.401 and 835.402.	(d) Results of maintenance and calibration performed on instruments and equipment as required by § 835.401(b).
§ 835.704 Administrative records.  (a) Training records shall be maintained, as necessary, to demonstrate compliance with §§ 835.901, 835.902, and 835.903.	§ 835.704 Administrative records.  (a) Training records shall be maintained, as necessary, to demonstrate compliance with § 835.901.
(b) Actions taken to maintain occupational exposures as low as reasonably achievable, including the actions required for this purpose by § 835.101, as well as facility design and control actions required by §§ 835.1001, 835.1002, and 835.1003, shall be documented.	(b) Actions taken to maintain occupational exposures as low as reasonably achievable, including the actions required for this purpose by § 835.101, as well as facility design and control actions required by §§ 835.1001, 835.1002 and 835.1003, shall be documented.
(c) Records shall be maintained to document the results of internal audits and other reviews of program content and implementation.	(c) Records shall be maintained to document the results of internal audits and other reviews of program content and implementation.
(d) Written declarations of pregnancy shall be maintained.	(d) Written declarations of pregnancy, including the estimated date of conception, and revocations of declarations of pregnancy shall be maintained.
(e) Changes in equipment, techniques, and procedures used for monitoring in the workplace shall be documented.	(e) Changes in equipment, techniques, and procedures used for monitoring shall be documented.

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	(f) Records shall be maintained as necessary to demonstrate compliance with the requirements of §§ 835.1201 and 835.1202 for sealed radioactive source control, inventory, and source leak tests.
<p>Subpart I--Reports to Individuals</p> <p>§ 835.801 Reports to individuals.</p> <p>(a) Radiation exposure data for individuals monitored in accordance with § 835.402 shall be reported as specified in this section. The information shall include the data required under § 835.702(c). Each notification and report shall be in writing and include: the DOE site or facility name, the name of the individual, and the individual's social security number or employee number.</p>	<p>Subpart I--Reports to Individuals</p> <p>§ 835.801 Reports to individuals.</p> <p>(a) Radiation exposure data for individuals monitored in accordance with § 835.402 shall be reported as specified in this section. The information shall include the data required under § 835.702(c). Each notification and report shall be in writing and include: the DOE site or facility name, the name of the individual, and the individual's social security number, employee number, or other unique identification number.</p>
<p>(b) Upon the request from an individual terminating employment, records of exposure shall be provided to that individual as soon as the data are available, but not later than 90 days after termination. A written estimate of the radiation dose received by that employee based on available information shall be provided at the time of termination, if requested.</p>	<p>(b) Upon the request from an individual terminating employment, records of exposure shall be provided to that individual as soon as the data are available, but not later than 90 days after termination. A written estimate of the radiation dose received by that employee based on available information shall be provided at the time of termination, if requested.</p>
<p>(c) Each DOE- or DOE-contractor-operated site or facility shall, on an annual basis, provide a radiation dose report to each individual monitored during the year at that site or facility in accordance with § 835.402.</p>	<p>(c) Each DOE- or DOE-contractor-operated site or facility shall, on an annual basis, provide a radiation dose report to each individual monitored during the year at that site or facility in accordance with § 835.402.</p>
<p>(d) Detailed information concerning any individual's exposure shall be made available to the individual upon request of that individual, consistent with the provisions of the Privacy Act (5 U.S.C. 552a).</p>	<p>(d) Detailed information concerning any individual's exposure shall be made available to the individual upon request of that individual, consistent with the provisions of the Privacy Act (5 U.S.C. 552a).</p>
<p>(e) When a DOE contractor is required to report to the Department, pursuant to Departmental requirements for occurrence reporting and processing, any exposure of an individual to radiation and/or radioactive material, or planned special exposure in accordance with § 835.204(e), the contractor shall also provide that individual with a report on his or her exposure data included therein. Such report shall be transmitted at a time not later than the transmittal to the Department.</p>	<p>(e) When a DOE contractor is required to report to the Department, pursuant to Departmental requirements for occurrence reporting and processing, any exposure of an individual to radiation and/or radioactive material, or planned special exposure in accordance with § 835.204(e), the contractor shall also provide that individual with a report on his or her exposure data included therein. Such report shall be transmitted at a time not later than the transmittal to the Department.</p>
<p>Subpart J--Radiation Safety Training</p> <p>§ 835.901 General employees.</p> <p>(a) All general employees shall be trained in radiation safety prior to receiving occupational exposure during access to controlled areas at a DOE site or facility. Allowance may be made for previous DOE training on generic radiation safety topics (i.e., those not specific to a site or facility), provided the training was received at another DOE site or facility within the past 2 years. Documentation of the previous training shall clearly identify the individual's name, date of training, topics covered, and name of the certifying individual. The knowledge of radiation safety possessed by general employees shall be verified by examination.</p>	<p>Subpart J--Radiation Safety Training</p> <p>§ 835.901 Radiation safety training.</p> <p>(a) Each individual shall complete radiation safety training on the topics established at § 835.901(c) commensurate with the hazards in the area and the required controls:</p> <ol style="list-style-type: none"> <li>(1) Before being permitted unescorted access to controlled areas; and</li> <li>(2) Before receiving occupational dose during access to controlled areas at a DOE site or facility.</li> </ol>

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(b) Retraining shall be provided when there is a significant change to radiation protection policies and procedures that affect general employees and shall be conducted at intervals not to exceed 2 years.	
<p>§ 835.902 Radiological workers.</p> <p>Radiological worker training programs and retraining shall be established and conducted at intervals not to exceed 2 years to familiarize the worker with the fundamentals of radiation protection and the ALARA process. Training shall include both classroom and applied training. Training shall either precede assignment as a radiological worker or be concurrent with assignment as a radiological worker if the worker is accompanied by and under the direct supervision of a trained radiological worker. Radiological worker training not specific to a given site or facility may be waived provided that: this training has been received at another DOE site or facility within the past 2 years; there is provision of proof-of-training in the form of a certification document containing the individual's name, date of training, and specific topics covered; and an appropriate official has certified the training of the individual. The knowledge of radiation safety possessed by radiological workers shall be verified by examination prior to an unsupervised assignment. The training shall include procedures specific to an individual's job assignment. The level of training is to be commensurate with each worker's assignment.</p>	<p>(b) Each individual shall demonstrate knowledge of the radiation safety training topics established in § 835.901(c), commensurate with the hazards in the area and required controls, by successful completion of an examination and performance demonstrations:</p> <p>(1) Before being permitted unescorted access to radiological areas; and</p> <p>(2) Before performing unescorted assignments as a radiological worker.</p>
	<p>(c) Radiation safety training shall include the following topics, to the extent appropriate to each individual's prior training, work assignments, and degree of exposure to potential radiological hazards:</p> <p>(1) Risks of exposure to radiation and radioactive materials, including prenatal radiation exposure;</p> <p>(2) Basic radiological fundamentals and radiation protection concepts;</p> <p>(3) Physical design features, administrative controls, limits, policies, procedures, alarms, and other measures implemented at the facility to manage doses and maintain doses ALARA, including both routine and emergency actions;</p> <p>(4) Individual rights and responsibilities as related to implementation of the facility radiation protection program;</p> <p>(5) Individual responsibilities for implementing ALARA measures required by § 835.101; and</p> <p>(6) Individual exposure reports that may be requested in accordance with § 835.801.</p>

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<p>§ 835.903 Radiological control technicians.</p> <p>Training and retraining programs for radiological control technicians shall be established and conducted at intervals not to exceed 2 years to familiarize technicians with the fundamentals of radiation protection and the proper procedures for maintaining exposures ALARA. This program shall include both classroom and applied training. The training shall either precede performance of tasks assigned to radiological control technicians or be concurrent with such task assignments if the individual is accompanied by and under the direct supervision of a trained individual. The required level of knowledge of radiation safety possessed by radiological control technicians shall be verified by examination to include demonstration prior to any unsupervised work assignment. The training program shall include procedures specific to the site or facility where the technician is assigned. The level of training shall be commensurate with the technician's assignment. Allowance may be made for previous DOE training on generic radiation safety topics (i.e., those not specific to a site or facility), provided the training was received within the past 2 years. Documentation of the previous training shall clearly identify the individual's name, date of training, topics covered, and name of the certifying individual.</p>	<p><i>Note: See § 835.104</i></p>
	<p>(d) When an escort is used in lieu of training in accordance with paragraph (a) or (b) of this section, the escort shall:</p> <p>(1) Have completed radiation safety training, examinations, and performance demonstrations required for entry to the area and performance of the work; and</p> <p>(2) Ensure that all escorted individuals comply with the documented radiation protection program.</p>
	<p>(e) Radiation safety training shall be provided to individuals when there is a significant change to radiation protection policies and procedures that may affect the individual and at intervals not to exceed 24 months. Such training provided for individuals subject to the requirements of § 835.901(b)(1) and (b)(2) shall include successful completion of an examination.</p>
	<p>§ 835.902 [Removed and Reserved].</p> <p>§ 835.903 [Removed and Reserved].</p>
<p>Subpart K--Design and Control</p> <p>§ 835.1001 Design and control.</p> <p>(a) Measures shall be taken to maintain radiation exposure in controlled areas as low as is reasonably achievable through facility and equipment design and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls and procedural requirements shall be employed only as supplemental methods to control radiation exposure.</p>	<p>Subpart K--Design and Control</p> <p>§ 835.1001 Design and control.</p> <p>(a) Measures shall be taken to maintain radiation exposure in controlled areas ALARA through physical design features and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls shall be employed only as supplemental methods to control radiation exposure.</p>

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(b) For specific activities where use of physical design features are demonstrated to be impractical, administrative controls and procedural requirements shall be used to maintain radiation exposures ALARA.	(b) For specific activities where use of physical design features is demonstrated to be impractical, administrative controls shall be used to maintain radiation exposures ALARA.
<p>§ 835.1002 Facility design and modifications.</p> <p>During the design of new facilities or modification of old facilities, the following objectives shall be adopted:</p> <p>(a) Optimization methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.</p> <p>(b) The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) shall be to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above shall be ALARA and shall not exceed 20 percent of the applicable standards in § 835.202.</p> <p>(c) Regarding the control of airborne radioactive material, the design objective shall be, under normal conditions, to avoid releases to the workplace atmosphere and in any situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation shall normally be used.</p> <p>(d) The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning.</p>	<p>§ 835.1002 Facility design and modifications.</p> <p>During the design of new facilities or modification of <b>existing</b> facilities, the following objectives shall be adopted:</p> <p>(a) Optimization methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.</p> <p>(b) The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) shall be to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above shall be ALARA and shall not exceed 20 percent of the applicable standards in § 835.202.</p> <p>(c) Regarding the control of airborne radioactive material, the design objective shall be, under normal conditions, to avoid releases to the workplace atmosphere and in any situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation shall normally be used.</p> <p>(d) The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning.</p>
<p>§ 835.1003 Control procedures.</p> <p>(a) During routine operations, the combination of design features and administrative control procedures shall provide that:</p> <p>(1) The anticipated magnitude of the total effective dose equivalent shall not exceed 5 rems (0.05 sievert) in a year;</p> <p>(2) The anticipated magnitude of the committed dose equivalent to any organ or tissue, plus any deep dose equivalent from external exposure, shall not exceed 50 rems (0.5 sievert) in a year; and</p> <p>(3) Exposure levels are as low as reasonably achievable.</p>	<p><b>§ 835.1003 Workplace Controls.</b></p> <p><b>During routine operations, the combination of physical design features and administrative controls shall provide that:</b></p> <p><b>(a) The anticipated occupational dose to general employees shall not exceed the limits established at § 835.202; and</b></p> <p><b>(b) The ALARA process is utilized for personnel exposures to ionizing radiation.</b></p>
(b) Compliance with the requirements in paragraph (a) of this section shall be demonstrated by appropriate monitoring pursuant to the provisions of subpart E of this part.	
Subpart L--Releases of Materials and Equipment from Radiological Areas	Subpart L - <b>Radioactive Contamination Control</b>

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<p>§ 835.1101 Releases of materials and equipment from radiological areas.</p> <p>The following requirements apply for the release of materials and equipment from radiological areas for use in controlled areas:</p> <p>(a) In radiological areas established to control surface or airborne radioactive material, material and equipment shall be treated as radioactive material and shall not be released from radiological areas to controlled areas if either of the following conditions exist:</p> <p>(1) Measurements of accessible surfaces show that either the total or removable contamination levels exceed the values specified in appendix D to this part; or</p> <p>(2) Prior use suggests that the contamination levels on inaccessible surfaces are likely to exceed the values specified in appendix D to this part.</p>	<p>§ 835.1101 Control of material and equipment.</p> <p>(a) Except as provided in paragraphs (b) and (c) of this section, material and equipment in contamination areas, high contamination areas, and airborne radioactivity areas shall not be released to a controlled area if:</p> <p>(1) Removable surface contamination levels on accessible surfaces exceed the removable surface contamination values specified in appendix D of this part; or</p> <p>(2) Prior use suggests that the removable surface contamination levels on inaccessible surfaces are likely to exceed the removable surface contamination values specified in appendix D of this part.</p>
<p>(b) Material and equipment exceeding the total or removable contamination levels specified in appendix D to this part may be conditionally released for movement on-site from one radiological area for immediate placement in another radiological area only if appropriate monitoring and control procedures are established and exercised.</p>	<p>(b) Material and equipment exceeding the removable surface contamination values specified in appendix D of this part may be conditionally released for movement on-site from one radiological area for immediate placement in another radiological area only if appropriate monitoring is performed and appropriate controls for the movement are established and exercised.</p>
<p>(c) Material and equipment with fixed contamination levels that exceed the limits specified in appendix D to this part may be released for use in controlled areas outside of the radiological areas with the following provisions:</p> <p>(1) Removable contamination levels are below the level specified in appendix D of this part; and</p> <p>(2) Materials shall be routinely monitored, clearly labeled, or tagged to alert personnel of the contaminated status; appropriate administrative procedures shall be established and exercised to maintain control of these items.</p>	<p>(c) Material and equipment with fixed contamination levels that exceed the total surface contamination values specified in appendix D of this part may be released for use in controlled areas outside of radiological areas only under the following conditions:</p> <p>(1) Removable surface contamination levels are below the removable surface contamination values specified in appendix D of this part; and</p> <p>(2) The material or equipment is routinely monitored and clearly marked or labeled to alert personnel of the contaminated status.</p>
<p>(d) The records for release of material and equipment shall describe the property, date on which the release survey was performed, identity of the individual who performed the survey, type and identification number of the survey instrument used, and results of the survey.</p>	<p><i>Note: See § 835.703(c).</i></p>
<p>§ 835.404 Radioactive contamination control and monitoring.</p> <p>(a) Instruments and techniques used for radioactive contamination monitoring and control shall be adequate to ensure compliance with the requirements specified in this section.</p> <p>(b) Appropriate controls shall be maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions.</p>	<p>§ 835.1102 Control of areas.</p> <p>(a) Appropriate controls shall be maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions.</p>

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<p>(c) Any area in which contamination levels exceed the values specified in appendix D of this part shall be:</p> <p>(1) Posted in accordance with § 835.603; and</p> <p>(2) Controlled in a manner commensurate with the physical and chemical characteristics of the contaminant, the radionuclides present, and the fixed and removable contamination levels.</p> <p>(d) Areas with fixed contamination exceeding the total radioactivity values specified in appendix D of this part may be located outside of radiological areas provided the following conditions are met:</p> <p>(1) Removable contamination levels are below the levels specified in appendix D of this part;</p> <p>(2) Unrestricted access to the area is not likely to cause any individual to receive a total effective dose equivalent in excess of 0.1 rem (0.001 sievert) in a year;</p> <p>(3) The area is routinely monitored;</p> <p>(4) The area is clearly marked to alert personnel of the contaminated status;</p> <p>(5) Appropriate administrative procedures are established and exercised to maintain control of these areas; and</p> <p>(6) Dose rates do not exceed levels which would require posting in accordance with § 835.603.</p> <p>(e) Entry control pursuant to § 835.501 and posting pursuant to § 835.603 are not required for areas with fixed contamination meeting the conditions of § 835.404(d).</p> <p>(f) Appropriate monitoring to detect and prevent the spread of contamination shall be performed by individuals exiting radiological areas established to control removable contamination and/or airborne radioactivity.</p> <p>(g) Protective clothing shall be required for entry to areas in which removable contamination exists at levels exceeding those specified in appendix D to this part.</p>	<p>(b) Any area in which contamination levels exceed the values specified in appendix D of this part shall be controlled in a manner commensurate with the physical and chemical characteristics of the contaminant, the radionuclides present, and the fixed and removable surface contamination levels.</p> <p>(c) Areas accessible to individuals where the measured total surface contamination levels exceed, but the removable surface contamination levels are less than, corresponding surface contamination values specified in appendix D of this part, shall be controlled as follows when located outside of radiological areas:</p> <p>(1) The area shall be routinely monitored to ensure the removable surface contamination level remains below the removable surface contamination values specified in appendix D of this part; and</p> <p>(2) The area shall be conspicuously marked to warn individuals of the contaminated status.</p> <p>(d) Individuals exiting contamination, high contamination, or airborne radioactivity areas shall be monitored, as appropriate, for the presence of surface contamination.</p> <p>(e) Protective clothing shall be required for entry to areas in which removable contamination exists at levels exceeding the removable surface contamination values specified in appendix D of this part.</p>
Subpart M - [Reserved]	<p>Subpart M--Sealed Radioactive Source Control</p> <p>§ 835.1201 Sealed radioactive source control.</p> <p>Sealed radioactive sources shall be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.</p>



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	<p>§ 835.1202 Accountable sealed radioactive sources.</p> <p>(a) Each accountable sealed radioactive source shall be inventoried at intervals not to exceed six months. This inventory shall:</p> <p>(1) Establish the physical location of each accountable sealed radioactive source;</p> <p>(2) Verify the presence and adequacy of associated postings and labels; and</p> <p>(3) Establish the adequacy of storage locations, containers, and devices.</p> <p>(b) Except for sealed radioactive sources consisting solely of gaseous radioactive material or tritium, each accountable sealed radioactive source shall be subject to a source leak test upon receipt, when damage is suspected, and at intervals not to exceed six months. Source leak tests shall be capable of detecting radioactive material leakage equal to or exceeding 0.005 microcurie.</p> <p>(c) Notwithstanding the requirements of paragraph (b) of this section, an accountable sealed radioactive source is not subject to periodic source leak testing if that source has been removed from service. Such sources shall be stored in a controlled location, subject to periodic inventory as required by paragraph (a) of this section, and subject to source leak testing prior to being returned to service.</p>
	<p>(d) Notwithstanding the requirements of paragraphs (a) and (b) of this section, an accountable sealed radioactive source is not subject to periodic inventory and source leak testing if that source is located in an area that is unsafe for human entry or otherwise inaccessible.</p> <p>(e) An accountable sealed radioactive source found to be leaking radioactive material shall be controlled in a manner that minimizes the spread of radioactive contamination.</p>
<p>Subpart N--Accidents and Emergencies</p> <p>§ 835.1301 General provisions.</p> <p>(a) A general employee whose occupational exposure has exceeded any of the limits specified in §§ 835.202 or 835.205 may be permitted to return to work in radiological areas during the current year providing that all of the following conditions are met:</p> <p>(1) Approval is first obtained from the contractor management and the Head of the responsible DOE field organization;</p> <p>(2) The individual receives counseling from radiological protection and medical personnel regarding the consequences of receiving additional occupational exposure during the year; and</p> <p>(3) The affected employee agrees to return to radiological work.</p>	<p>Subpart N--Emergency Exposure Situations</p> <p>§ 835.1301 General provisions.</p> <p>(a) A general employee whose occupational dose has exceeded the numerical value of any of the limits specified in § 835.202 as a result of an authorized emergency exposure may be permitted to return to work in radiological areas during the current year providing that all of the following conditions are met:</p> <p>(1) Approval is first obtained from the contractor management and the Head of the responsible DOE field organization;</p> <p>(2) The individual receives counseling from radiological protection and medical personnel regarding the consequences of receiving additional occupational exposure during the year; and</p> <p>(3) The affected employee agrees to return to radiological work.</p>
<p>(b) All exposures exceeding the limits specified in §§ 835.202 or 835.205 shall be recorded in the affected individual's occupational exposure file and reported to the DOE in accordance with Departmental requirements for occurrence reporting and processing.</p>	<p>(b) All doses exceeding the limits specified in § 835.202 shall be recorded in the affected individual's occupational dose record.</p>

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(c) When the conditions under which the emergency or accident exposures were received have been eliminated, operating management shall notify the Head of the responsible DOE field organization.	(c) When the conditions under which a dose was received in excess of the limits specified in § 835.202, except those doses received in accordance with § 835.204, have been eliminated, operating management shall notify the Head of the responsible DOE field organization.
(d) Operations after an emergency or accidental exposure in excess of the limits specified in §§ 835.202 or 835.205 may be resumed only with the approval of the DOE.	(d) Operations after a dose was received in excess of the limits specified in § 835.202, except those received in accordance with § 835.204, may be resumed only with the approval of DOE.
(e) Occurrence reports to DOE regarding emergencies and/or accidents shall be prepared and submitted in accordance with Departmental requirements for occurrence reporting and processing.	
§ 835.1302 Emergency exposure situations.  (a) The risk of injury to those individuals involved in rescue and recovery operations shall be minimized. (b) Operating management shall weigh actual and potential risks to rescue and recover individuals against the benefits to be gained. (c) Rescue action that might involve substantial personal risk shall be performed by volunteers.	§ 835.1302 Emergency exposure situations.  (a) The risk of injury to those individuals involved in rescue and recovery operations shall be minimized. (b) Operating management shall weigh actual and potential risks against the benefits to be gained. (c) No individual shall be required to perform rescue action that might involve substantial personal risk.
(d) The dose limits for individuals performing these operations are as follows: [Table Omitted for Brevity]	
(e) Each individual selected shall be trained in accordance with § 835.902 and briefed beforehand of the known or anticipated hazards to which the individual will be subjected.	(d) Each individual authorized to perform emergency actions likely to result in occupational doses exceeding the values of the limits provided at § 835.202(a) shall be trained in accordance with § 835.901(b) and briefed beforehand on the known or anticipated hazards to which the individual will be subjected.
§ 835.1303 [Reserved]  § 835.1304 Nuclear accident dosimetry.  (a) Installations possessing sufficient quantities of fissile material to potentially constitute a critical mass, such that the excessive exposure of personnel to radiation from a nuclear accident is possible, shall provide nuclear accident dosimetry for those personnel.	§ 835.1303 [Reserved]  § 835.1304 Nuclear accident dosimetry.  (a) Installations possessing sufficient quantities of fissile material to potentially constitute a critical mass, such that the excessive exposure of individuals to radiation from a nuclear accident is possible, shall provide nuclear accident dosimetry for those individuals.
(b) Nuclear accident dosimetry shall include the following: (1) A method to conduct initial screening of personnel involved in a nuclear accident to determine whether significant exposures to radiation occurred; (2) Methods and equipment for analysis of biological materials; (3) A system of fixed nuclear accident dosimeter units; and (4) Personal nuclear accident dosimeters worn by all personnel who enter locations in which installed criticality alarm systems are required.	(b) Nuclear accident dosimetry shall include the following: (1) A method to conduct initial screening of individuals involved in a nuclear accident to determine whether significant exposures to radiation occurred; (2) Methods and equipment for analysis of biological materials; (3) A system of fixed nuclear accident dosimeter units; and (4) Personal nuclear accident dosimeters.

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<p><b>Appendix A to Part 835--DERIVED AIR CONCENTRATIONS (DAC) FOR CONTROLLING RADIATION EXPOSURE TO WORKERS AT DOE FACILITIES</b></p> <p>[Table omitted for brevity.]</p>	<p><b>Appendix A to Part 835--DERIVED AIR CONCENTRATIONS (DAC) FOR CONTROLLING RADIATION EXPOSURE TO WORKERS AT DOE FACILITIES</b></p> <p>The data presented in appendix A are to be used for controlling individual internal doses in accordance with § 835.209, identifying the need for air monitoring in accordance with § 835.403, and identifying and posting airborne radioactivity areas in accordance with § 835.603(d).</p> <p>The DAC values are given for individual radionuclides. For known mixtures of radionuclides, determine the sum of the ratio of the observed concentration of a particular radionuclide and its corresponding DAC for all radionuclides in the mixture. If this sum exceeds unity (1), then the DAC has been exceeded. For unknown radionuclides, the most restrictive DAC (lowest value) for those isotopes not known to be absent shall be used.</p> <p>[Table omitted for brevity.]</p>
<p>The derived air concentrations (DAC) for limiting radiation exposures through inhalation of radionuclides by workers are listed in this appendix. The values are based on either a stochastic (committed effective dose equivalent) dose limit of 5 rems (0.05 Sv) or a nonstochastic (organ) dose limit of 50 rems (0.5 Sv) per year, whichever is more limiting.</p> <p>Note: the 15 rems (0.15 Sv) dose limit for the lens of the eye does not appear as a critical organ dose limit.</p> <p>The columns in this appendix contain the following information: (1) Radionuclide; (2) inhaled air DAC for lung retention class D, W, and Y in units of <math>\mu\text{Ci}/\text{ml}</math>; (3) inhaled air DAC for lung retention class D, W, and Y in units of <math>\text{Bq}/\text{m}^3</math>; (4) an indication of whether or not the DAC for each class is controlled by the stochastic (effective dose equivalent) or nonstochastic (tissue) dose. The classes D, W, and Y have been established to describe the clearance of inhaled radionuclides from the lung. This classification refers to the approximate length of retention in the pulmonary region. Thus, the range of half-times for retention in the pulmonary region is less than 10 days for class D (days), from 10 to 100 days for class W (weeks), and greater than 100 days for class Y (years). The DACs are listed by radionuclide, in order of increasing atomic mass, and are based on the assumption that the particle size distribution of 1 <math>\mu\text{m}</math> is used. For situations where the particle size distribution is known to differ significantly from 1 <math>\mu\text{m}</math>, appropriate corrections can be made to both the estimated dose to workers and the DACs.</p>	<p>The derived air concentrations (DAC) for limiting radiation exposures through inhalation of radionuclides by workers are listed in this appendix. The values are based on either a stochastic (committed effective dose equivalent) dose limit of 5 rems (0.05 Sv) or a nonstochastic (organ) dose limit of 50 rems (0.5 Sv) per year, whichever is more limiting.</p> <p>Note: the 15 rems (0.15 Sv) dose limit for the lens of the eye does not appear as a critical organ dose limit.</p> <p>The columns in this appendix contain the following information: (1) Radionuclide; (2) inhaled air DAC for lung retention class D, W, and Y in units of <math>\text{uCi}/\text{ml}</math>; (3) inhaled air DAC for lung retention class D, W, and Y in units of <math>\text{Bq}/\text{m}^3</math>; (4) an indication of whether or not the DAC for each class is controlled by the stochastic (effective dose equivalent) or nonstochastic (tissue) dose. The classes D, W, and Y have been established to describe the clearance of inhaled radionuclides from the lung. This classification refers to the approximate length of retention in the pulmonary region. Thus, the range of half-times for retention in the pulmonary region is less than 10 days for class D (days), from 10 to 100 days for class W (weeks), and greater than 100 days for class Y (years). The DACs are listed by radionuclide, in order of increasing atomic mass, and are based on the assumption that the particle size distribution of 1 <math>\mu\text{m}</math> is used. For situations where the particle size distribution is known to differ significantly from 1 <math>\mu\text{m}</math>, appropriate corrections can be made to both the estimated dose to workers and the DACs.</p>

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<p><u>Footnotes for Appendix A</u></p> <p><sup>1</sup> A determination of whether the DACs are controlled by stochastic (St) or nonstochastic (organ) dose, or if they both give the same result (E), for each lung retention class, is given in this column. The key to the organ notation for nonstochastic dose is: BS = Bone surface, K = Kidney, L = Liver, SW = Stomach wall, and T = Thyroid. A blank indicates that no calculations were performed for the lung retention class shown.</p> <p><sup>2</sup> The ICRP identifies tritiated water and carbon as having immediate uptake and distribution; therefore no solubility classes are designated. For the purposes of this table, the DAC values are shown as being constant, independent of solubility class. For tritiated water, the inhalation DAC values allow for an additional 50% absorption through the skin, as described in ICRP Publication No. 30: Limits for Intakes of Radionuclides by Workers. For elemental tritium, the DAC values are based solely on consideration of the dose-equivalent rate to the tissues of the lung from inhaled tritium gas contained within the lung, without absorption in the tissues.</p> <p><sup>3</sup> A dash indicates no values given for this data category.</p>	<p><u>Footnotes for Appendix A</u></p> <p><sup>1</sup> A determination of whether the DACs are controlled by stochastic (St) or nonstochastic (organ) dose, or if they both give the same result (E), for each lung retention class, is given in this column. The key to the organ notation for nonstochastic dose is: BS = Bone surface, K = Kidney, L = Liver, SW = Stomach wall, and T = Thyroid. A blank indicates that no calculations were performed for the lung retention class shown.</p> <p><sup>2</sup> The ICRP identifies tritiated water and carbon as having immediate uptake and distribution; therefore no solubility classes are designated. For the purposes of this table, the DAC values are shown as being constant, independent of solubility class. For tritiated water, the inhalation DAC values allow for an additional 50% absorption through the skin, as described in ICRP Publication No. 30: Limits for Intakes of Radionuclides by Workers. For elemental tritium, the DAC values are based solely on consideration of the dose-equivalent rate to the tissues of the lung from inhaled tritium gas contained within the lung, without absorption in the tissues.</p> <p><sup>3</sup> A dash indicates no values given for this data category.</p>
<p><sup>4</sup> These values are appropriate for protection from radon combined with its short-lived daughters and are based on information given in ICRP Publication 32: Limits for Inhalation of Radon Daughters by Workers and Federal Guidance Report No. 11: Limiting Values of Radionuclide Intake and Air Concentrations, and Dose Conversion Factors for Inhalation, Submersion, and Ingestion (EPA 520/1-88-020). The values given are for 100% equilibrium concentration conditions of the radon daughters with the parent. To allow for an actual measured equilibrium concentration or a demonstrated equilibrium concentration, the values given in this table should be multiplied by the ratio (100%/actual %) or (100%/demonstrated %), respectively. Alternatively, the DAC values for Rn-220 and Rn-222 may be replaced by 1 WL* and 1/3 WL*, respectively, for appropriate limiting of daughter concentrations. Because of the dosimetric considerations for radon, no <math>f_1</math> or lung clearance values are listed.</p>	<p><sup>4</sup> These values are appropriate for protection from radon combined with its short-lived daughters and are based on information given in ICRP Publication 32: Limits for Inhalation of Radon Daughters by Workers and Federal Guidance Report No. 11: Limiting Values of Radionuclide Intake and Air Concentrations, and Dose Conversion Factors for Inhalation, Submersion, and Ingestion (EPA 520/1-88-020). The values given are for 100% equilibrium concentration conditions of the radon daughters with the parent. To allow for an actual measured equilibrium concentration or a demonstrated equilibrium concentration, the values given in this table should be multiplied by the ratio (100%/actual %) or (100%/demonstrated %), respectively. Alternatively, the DAC values for Rn-220 and Rn-222 may be replaced by 1 WL* and 1/3 WL*, respectively, for appropriate limiting of daughter concentrations. Because of the dosimetric considerations for radon, no <math>f_1</math> or lung clearance values are listed.</p>
<p>* A "Working Level" (WL) is any combination of short-lived radon daughters, in one liter of air without regard to the degree of equilibrium, that will result in the ultimate emission of 1.3 E+05 MeV of alpha energy.</p> <p><sup>5</sup> For the calculations, <math>f_1</math> values were obtained from ICRP Publication 48: The Metabolism of Plutonium and Related Elements. It is assumed that the effective dose equivalents for inhalation are unchanged even though the <math>f_1</math> values have changed. This is because the contribution to organ dose from inhalation is dependent mainly on transfer from lung to blood when <math>f_1</math> values are small. Also, the gastrointestinal tract dose would be unchanged because the fraction of activity passing through the tract is (1.0 - <math>f_1</math>).</p>	<p>* A "Working Level" (WL) is any combination of short-lived radon daughters, in one liter of air without regard to the degree of equilibrium, that will result in the ultimate emission of 1.3 E+05 MeV of alpha energy.</p>
<p><b>Appendix B to Part 835--ALTERNATIVE ABSORPTION FACTORS AND LUNG RETENTION CLASSES FOR SPECIFIC COMPOUNDS</b></p> <p style="text-align: center;"><i>[Table Omitted for Brevity]</i></p>	<p><b>Appendix B to Part 835--[Reserved]</b></p>

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<p><b>Appendix C to Part 835--DERIVED AIR CONCENTRATION (DAC) FOR WORKERS FROM EXTERNAL EXPOSURE DURING IMMERSION IN A CONTAMINATED ATMOSPHERIC CLOUD</b></p> <p style="text-align: center;">[Table Omitted for Brevity]</p> <p>The air immersion DAC values shown in this appendix are based on a stochastic limit of 5 rems (0.05 Sv) per year or a nonstochastic (organ) dose limit of 50 rems (0.5 Sv) per year. Four columns of information are presented: (1) radionuclide; (2) half-life in units of seconds (s), minutes (min), hours (h), days (d), or years (yr); (3) air immersion DAC in units of uCi/ml; and (4) air immersion DAC in units of Bq/m<sup>3</sup>. The data are listed by radionuclide in order of increasing atomic mass. The air immersion DACs were calculated for a continuous, nonshielded exposure via immersion in a semi-infinite atmospheric cloud.</p> <p>The DAC value for air immersion listed for a given radionuclide is determined either by a yearly limit on effective dose equivalent, which provides a limit on stochastic radiation effects, or by a limit on yearly dose equivalent to any organ, which provides a limit on nonstochastic radiation effects. For most of the radionuclides listed, the DAC value is determined by the yearly limit on effective dose equivalent. Thus, the few cases where the DAC value is determined by the yearly limit on shallow dose equivalent to the skin are indicated in the table by an appropriate footnote. Again, the DACs listed in this appendix account only for immersion in a semi-infinite cloud and do not account for inhalation or ingestion exposures.</p>	<p><b>Appendix C to Part 835--DERIVED AIR CONCENTRATION (DAC) FOR WORKERS FROM EXTERNAL EXPOSURE DURING IMMERSION IN A CONTAMINATED ATMOSPHERIC CLOUD</b></p> <p style="text-align: center;">[Table revised, but omitted for brevity; see FR Notice.]</p> <p>a. The data presented in appendix C are to be used for controlling occupational exposures in accordance with § 835.209, identifying the need for air monitoring in accordance with § 835.403 and identifying the need for posting of airborne radioactivity areas in accordance with § 835.603(d).</p> <p>b. The air immersion DAC values shown in this appendix are based on a stochastic <b>dose</b> limit of 5 rems (0.05 Sv) per year or a nonstochastic (organ) dose limit of 50 rems (0.5 Sv) per year. Four columns of information are presented: (1) radionuclide; (2) half-life in units of seconds (s), minutes (min), hours (h), days (d), or years (yr); (3) air immersion DAC in units of uCi/ml; and (4) air immersion DAC in units of Bq/m<sup>3</sup>. The data are listed by radionuclide in order of increasing atomic mass. The air immersion DACs were calculated for a continuous, nonshielded exposure via immersion in a semi-infinite atmospheric cloud. The DACs listed in this appendix may be modified to allow for submersion in a cloud of finite dimensions.</p> <p>c. The DAC value for air immersion listed for a given radionuclide is determined either by a yearly limit on effective dose equivalent, which provides a limit on stochastic radiation effects, or by a limit on yearly dose equivalent to any organ, which provides a limit on nonstochastic radiation effects. For most of the radionuclides listed, the DAC value is determined by the yearly limit on effective dose equivalent. Thus, the few cases where the DAC value is determined by the yearly limit on shallow dose equivalent to the skin are indicated in the table by an appropriate footnote. Again, the DACs listed in this appendix account only for immersion in a semi-infinite cloud and do not account for inhalation or ingestion exposures.</p>

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<p>Three classes of radionuclides are included in the air immersion DACs as described below.</p> <p>(1) <u>Class 1</u>. The first class of radionuclides includes selected noble gases and short-lived activation products that occur in gaseous form. For these radionuclides, inhalation doses are negligible compared to the external dose from immersion in an atmospheric cloud.</p> <p>(2) <u>Class 2</u>. The second class of radionuclides includes those for which a DAC value for inhalation has been calculated, but for which the DAC value for external exposure to a contaminated atmospheric cloud is more restrictive (i.e., results in a lower DAC value). These radionuclides generally have half-lives of a few hours or less, or are eliminated from the body following inhalation sufficiently rapidly to limit the inhalation dose.</p> <p>(3) <u>Class 3</u>. The third class of radionuclides includes selected isotopes with relatively short half-lives. These radionuclides typically have half-lives that are less than 10 minutes, they do not occur as a decay product of a longer lived radionuclide, or they lack sufficient decay data to permit internal dose calculations. These radionuclides are also typified by a radioactive emission of highly intense, high-energy photons and rapid removal from the body following inhalation.</p> <p>The DAC values are given for individual radionuclides. For known mixtures of radionuclides, the sum of the ratio of the observed concentration of a particular radionuclide and its corresponding DAC for all radionuclides in the mixture must not exceed 1.0. For unknown radionuclides, the most restrictive DAC (lowest value) for those isotopes not known to be absent shall be used.</p>	<p><b>d.</b> Three classes of radionuclides are included in the air immersion DACs as described below.</p> <p>(1) <u>Class 1</u>. The first class of radionuclides includes selected noble gases and short-lived activation products that occur in gaseous form. For these radionuclides, inhalation doses are negligible compared to the external dose from immersion in an atmospheric cloud.</p> <p>(2) <u>Class 2</u>. The second class of radionuclides includes those for which a DAC value for inhalation has been calculated, but for which the DAC value for external exposure to a contaminated atmospheric cloud is more restrictive (i.e., results in a lower DAC value). These radionuclides generally have half-lives of a few hours or less, or are eliminated from the body following inhalation sufficiently rapidly to limit the inhalation dose.</p> <p>(3) <u>Class 3</u>. The third class of radionuclides includes selected isotopes with relatively short half-lives. These radionuclides typically have half-lives that are less than 10 minutes, they do not occur as a decay product of a longer lived radionuclide, or they lack sufficient decay data to permit internal dose calculations. These radionuclides are also typified by a radioactive emission of highly intense, high-energy photons and rapid removal from the body following inhalation.</p> <p><b>e. The DAC values are given for individual radionuclides. For known mixtures of radionuclides, determine the sum of the ratio of the observed concentration of a particular radionuclide and its corresponding DAC for all radionuclides in the mixture. If this sum exceeds unity (1), then the DAC has been exceeded. For unknown radionuclides, the most restrictive DAC (lowest value) for those isotopes not known to be absent shall be used.</b></p>

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<p><b>Appendix D to Part 835--Surface Radioactivity Values</b></p> <p style="text-align: center;">[Table Omitted for Brevity]</p> <p><sup>1</sup> The values in this appendix apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.</p> <p><sup>2</sup> As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.</p> <p><sup>3</sup> The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm<sup>2</sup> is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) from measurements of a representative number n of sections it is determined that <math>1/n \sum S_i \leq G</math>, where <math>S_i</math> is the dpm/100 cm<sup>2</sup> determined from measurement of section i; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm<sup>2</sup> area exceeds 3G.</p>	<p><b>Appendix D to Part 835--SURFACE CONTAMINATION VALUES</b></p> <p style="color: red;">The data presented in appendix D are to be used in identifying and posting contamination and high contamination areas in accordance with § 835.603(e) and (f) and identifying the need for surface contamination monitoring and control in accordance with § 835.1101 and 1102.</p> <p style="text-align: center;"><i>[Table revised, but omitted for brevity; see FR Notice.]</i></p> <p><sup>1</sup> The values in this appendix, <span style="color: red;">with the exception noted in footnote 5 below</span>, apply to radioactive contamination deposited on, but not incorporated into the interior <span style="color: red;">or matrix</span> of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting <span style="color: red;">nuclides apply independently</span>.</p> <p><sup>2</sup> As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.</p> <p><sup>3</sup> The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm<sup>2</sup> is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the <span style="color: red;">surface contamination value if: (1) from measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm<sup>2</sup> area exceeds three times the applicable value.</span></p>



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<p><sup>4</sup> The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note - The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm<sup>2</sup> is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and Ra-228, Ac-227, Th-228, Th-230, Pa-231 and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.</p> <p><sup>5</sup> This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.</p>	<p><sup>4</sup> The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note - The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm<sup>2</sup> is determined, the activity per unit area shall be based on the actual area and the entire surface shall be wiped. <b>It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.</b></p> <p><sup>5</sup> This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.</p> <p><sup>6</sup> Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply.</p> <p><sup>7</sup> (alpha)</p>
	<p><b>Appendix E to Part 835--VALUES FOR ESTABLISHING SEALED RADIOACTIVE SOURCE ACCOUNTABILITY AND RADIOACTIVE MATERIAL POSTING AND LABELING REQUIREMENTS</b></p> <p>The data presented in appendix E are to be used for identifying accountable sealed radioactive sources and radioactive material areas as those terms are defined at § 835.2(a), establishing the need for radioactive material area posting in accordance with § 835.603(g), and establishing the need for radioactive material labeling in accordance with § 835.605.</p> <p>Note: The data in this table are listed in alphabetical order by nuclide.</p> <p style="text-align: center;"><i>[Table new and omitted for brevity; see FR Notice.]</i></p> <p>Any alpha emitting radionuclide not listed above and mixtures of alpha emitters of unknown composition have a value of 10 microcuries.</p> <p>Any radionuclide other than alpha emitting radionuclides not listed above and mixtures of beta emitters of unknown composition have a value of 100 microcuries.</p> <p>Note: Where there is involved a combination of radionuclides in known amounts, derive the value for the combination as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the value otherwise established for the specific radionuclide when not in combination. If the sum of such ratios for all radionuclides in the combination exceeds unity (1), then the accountability criterion has been exceeded.</p>

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